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Skeptical Inquirer

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Obesity: Epidemic or Myth?

Einstein and the World Year of Physics

- We Can Still Learn Lessons from Einstein's Watershed Year
- Special Relativity after 100 Years
- The Twin Paradox

The Elixir of Life: Green Tea or Red Wine?

Stargazers and Palm Readers: A Critique of Futurism

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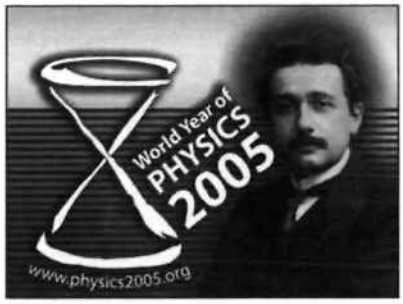

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EDITOR'S NOTE

Obesity Epidemic? Elixirs of Life? Where's the Truth?

Are we in the midst of an obesity epidemic? And if so, what does that mean for our health, really? A 1999 study estimated that 280,000 deaths a year in the United States alone are attributable to obesity. The Centers for Disease Control and Prevention (CDC) began a campaign pointing to urgent dangers of obesity. A report then increased the number of expected obesity-related deaths to 400,000. But this year another study, this one also involving a CDC researcher, found the number of overweight and obesity-related deaths was actually 26,000, only about one-fifteenth the earlier number. In the meantime, a new book argues that the health dangers of obesity are a myth, and a group advocating consumer freedom sees a conspiracy of interests that market weight-loss drugs. What is going on?

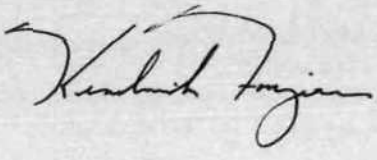
In our cover article, "Obesity: Epidemic or Myth?" Patrick Johnson takes a calm, reasoned look at the issue, applying critical analysis to help untangle the web of claims and counterclaims. What does he find? Well, it may seem uncommon to find this statement in our pages, but in this case the truth is somewhere in between. "Looking at the scientific evidence," he writes, "it is clear that the extreme views on either side of the argument are incorrect. There is no doubt that many of our concerns about obesity are alarmist and exaggerated, but it is also apparent that there is a real health risk associated with it."

Differences in details among the various studies account for some of the discrepancies. Also evident is the scientific method at work, a subsequent study helping correct certain deficiencies of preceding ones. And definitions come into play, such as *obese* versus *overweight*. And so do differences in behavior—an overweight person who exercises regularly may be better off than a normal-weight person who doesn't. All in all, the lesson is, as Johnson says, "rational moderation." It's an important and intriguing topic, of more than passing interest to the millions of people who wonder if their few extra pounds are taking years off of their lives.

In the second article, William Baarschers does for green tea and red wine what Johnson did in examining the medical studies about obesity. He takes a reasoned look at all the various medical studies that assert positive health effects for green tea and red wine, and the result is a balanced look at what they really show—and don't show.

* * *

One hundred years ago this year, a young Albert Einstein had one of the single most productive years of anyone in the entire history of science. In 1905, he published five of his most seminal papers, any one of which would have secured his reputation forever. The scientific community has designated 2005 the World Year of Physics to honor the centennial of Einstein's incredible year. In a short section in this issue three authors briefly review what Einstein accomplished and look into why, although his special relativity has been so phenomenally successful, its nonintuitive notions about time and simultaneity can still be so difficult to grasp.



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Bill Nye Launches 'The Eyes of Nye'

Bill Nye is a 1977 graduate of Cornell University in Ithaca, New York, and was taught by Carl Sagan. He is a Fellow of the Committee for the Scientific Investigation of Claims of the Paranormal. He is also the proud designer of the Boeing hydraulic pressure resonance suppressor, still used in Boeing 747s.

However, Nye is best known for his children's show *Bill Nye, the Science Guy.* The series won twenty-eight Emmy awards during its run between 1992 and 1998 on PBS. Bill Nye is back on television with his new show *The Eyes of Nye,* and this time his series is directed at an adult audience. The show examines such topics as pseudoscience, antibiotics, population, the evolution of sex, addiction, climate change, cloning, and modified foods. "[People] need to understand the science and ethical considerations to form their opinions," says Nye. "Some of these are issues that will affect humanity for decades to come."

Information about the series can be found at www.eyesofnye.org. The Web site features episode summaries, Nye's recommended reading, interviews with scientists, and the "flip side" (an examination of the other side of the argument). For more information about Bill Nye or the series, visit www.nyelabs.com.

—Kim Stewart

Kim Stewart is an intern in the editorial department at the Center for Inquiry in Amherst, New York.

Gallup Poll Shows that Americans' Belief in the Paranormal Persists

Despite the best efforts of CSICOP and other skeptical organizations, the results of a poll conducted June 6 through 8, 2005, by the Gallup Organization show that very nearly three quarters of Americans continue to believe in the paranormal.

Participants were presented with a list of ten potential paranormal beliefs: extrasensory perception (41 percent of the respondents acknowledged belief in this item), haunted houses (37 percent), ghosts (32 percent), telepathy (31 percent), clairvoyance (26 percent), astrology (25 percent), communication with the dead (21 percent), witches (21 percent), reincarnation (20 percent), and channeling spiritual entities (9 percent). Gallup designated these items *paranormal* because they "require the belief that humans have more than the 'normal' five senses." Three other beliefs were presented in the poll that don't meet this criterium for paranormality: psychic healing—because "the healing powers of the mind have been demonstrated empirically, reflected in the power of placebos" (55 percent); demonic possession—because it is unclear how many respondents "interpret[ed that statement] in metaphorical terms" (42 percent); and extraterrestrial visitations—because "the existence of extra-terrestrial (*sic*) beings and their ability to visit earth are subject to empirical verification" (24 percent).

Gallup's analysis of the raw data revealed that 73 percent, almost three quarters of the people who responded to the poll, believe in at least one of the ten items that were presented to them, down only very slightly from the 76 percent that was determined by an identical poll that was conducted in 2001. Only one percent believe in all ten items, but as the number of items is reduced from ten, the cumulative percentage of believers rises dramatically. Data from similar polls going back to 1990 indicate a steady, if slow, rise in belief in a number of the items listed.

These results are statistically relevant across lines of "age, gender, education, race, and region of the country," according to Gallup. There is, however, some difference between Christians and non-Christians: the former group scores a 75 percent likelihood of belief, while the latter scores 66 percent. But both groups, as these statistics demonstrate, have a paranormal-positive majority.

On the positive side, at least from a skeptical perspective, the poll also showed that 27 percent of the respondents believe in none of the ten items listed.

One thousand and two people, age eighteen and older, were surveyed for this most recent poll via telephone, and Gallup reports a 95 percent confidence interval in the data with a maximum margin of sampling error of ±3. The choices of answers that were offered for each question were "Believe in," "Not sure about," "Don't believe," and "No opinion."

—David Park Musella

David Park Musella is an editorial assistant with SKEPTICAL INQUIRER.

Famous 'Psychic Healer' Arrested in Toronto

On June 14, 2005, police in Toronto, Canada, arrested a self-proclaimed "psychic healer" named Alex Orbito. The sixty-year-old Filipino man became wanted by police after a number of victims came forward to report that

Alex Orbito

he "treated" 600 people in his Best Western Hotel room in Scarborough, Ontario, charging C$135 for two-minute "healing" treatments. He claimed that he could heal any illness by removing "negative energies" and performing psychic surgery. Orbito and an accomplice were arrested and charged with fraud over $5,000 and possession of proceeds of crime. Police estimated that Orbito made over $80,000 in the three-day period.

According to Detective Doug Dunstan, "Our concern is that he is a fake and he is taking money away from people who are suffering from serious illnesses like cancer." Orbito is a well-known faith healer in the Philippines and has constructed the "Pyramid of Asia," which he claims channels so much psychic energy that after twenty minutes of exposure it proves fatal to visitors (though apparently not insects; the pyramid recently underwent repair for termite damage). Orbito has traveled the world promoting his healings, and achieved fame as a result of Shirley MacLaine's book *Going Within: A Guide for Inner Transformation*, in which she lists him as one of the world's top psychic surgeons.

Orbito performed his surgery on clients by using sleight of hand magician tricks including using chicken organs as removed tumors and concealed balloons of blood. Orbito was released on bail for $35,000 and was scheduled to stand trial in July.

—*Kim Stewart*

Italian Skeptics Debunk Crop Circle Electromagnetic Radiation Claim

Three researchers from the Italian skeptics group CICAP (Italian Committee for the Investigation of Claims of the Paranormal) have published a scientific paper titled "Balls of Light: The Questionable Science of Crop Circles." Francesco Grassi, Claudio Cocheo, and Paolo Russo published the paper in the Summer 2005 issue of the *Journal of Scientific Exploration* (*JSE*), 19(2).

The paper examines the hypotheses contained in three earlier papers respectively authored by W.C. Levengood (1994), W.C. Levengood and N.P. Talbott (1999), and by E.H. Haselhoff (2001). These three papers suggested the involvement of some kind of electromagnetic radiation during the creation of crop circles. Some actually considered them to be the "scientific reference point" for the crop circles phenomenon.

Wheat stalks, similar to these taken from a crop circle, were examined by W.C. Levengood and others. (Photo by Benjamin Radford)

Because of the sensational "scientific" contents of those findings, CICAP conducted a more exhaustive inspection of the data and the statistical analyses.

Grassi et al. discuss the methods and conclusions of the three articles, pointing out the misrepresentation of the experimental protocols, the misleading application of statistical procedures, the arbitrary discarding of unwanted results, and the weakness of the proposed physical models to the suggested hypotheses. In particular, they show that both Levengood and Talbott and Haselhoff's conclusions are unsubstantiated and do not prove the involvement of an electromagnetic radiation source in the creation of crop circles.

The Grassi et al. report reveals also another important development that happened before the *JSE* publication. *Physiologia Plantarum*, the journal that published the three papers in question, played a crucial role in promoting them as the "scientific reference point" of the subject and giving them scientific support and credibility. While *Physiologia Plantarum* agreed with CICAP about the pseudo-scientific aspects of the three articles, the journal refused to publish its critique, responding, "there is not a scientific discussion going on the crop circle subject."

After a detailed discussion, the Grassi et al. report concludes that the claims put forward by Levengood, Talbott, and Haselhoff in their three papers are not supported at all by the available evidence, which demonstrate nothing but a mere difference in the stem elongation between the flattened plants lying inside the circles and those standing outside them—as one should expect when whatever kind of mechanical force flattens the plants.

Interested SI readers can visit www.cicap.org/crops/en, where it is possible to download not only the original *JSE* article but also other articles and information about crop circles.

Daniel Petre Corogeanu, center, is the Orthodox monk believed to have led the exorcism that caused the death of Maricica Irina Cornici. (Photo credit: RADU ANECULAESI/AFP/Getty Images)

Deadly Rituals: Nun Dies During Convent Exorcism

An exorcism at a convent in the small Romanian town of Tanacu resulted in the death of Maricica Irina Cornici, a twenty-three-year-old nun who said she heard the devil telling her she was sinful. With assistance from four nuns, priest Daniel Corogeanu bound Cornici to a cross, gagged her mouth with a towel, and left her for three days without food or water. The ritual, the priest explained, was an effort to drive devils out of the woman. Cornici was found dead on June 15; an autopsy found she had died of suffocation and dehydration. Cornici, who had a history of schizophrenia, reportedly had recently visited the convent and soon after joined the order. The Orthodox Church admitted that Corogeanu had been ordained as a priest without completing his theological studies, and condemned Cornici's death.

While many Americans likely think of exorcisms as relics of the Dark Ages, exorcisms have been (and continue to be) performed, often on people who are emotionally and mentally disturbed. Whether those undergoing the exorcism are truly possessed by spirits or demons is another matter entirely. Most often, exorcisms are done on people of strong religious faith. To the extent that exorcisms "work," it is primarily due to the power of suggestion and the placebo effect. If you believe you are possessed, and that a given ritual will cleanse you, then it just might. (For more on exorcisms, see Joe Nickell's Investigative Files column in the January/February 2001 SI.)

A 2001 book on the topic, Michael Cuneo's *American Exorcism: Expelling Demons in the Land of Plenty,* found no reason to think that anything supernatural occurs during exorcisms. After attending fifty exorcisms, Cuneo is unequivocal about the fact that he saw nothing supernatural—and certainly nothing remotely resembling the events depicted in the 1973 blockbuster film *The Exorcist.* No spinning heads, levitation, or poltergeists were seen, though many involved some cursing, spitting, or vomiting.

This is not the first time that exorcisms have cost innocent lives. On August 22, 2003, an autistic eight-year-old boy in Milwaukee was bound in sheets and held down by church members during a prayer service held to exorcise the evil spirits they blamed for his condition. An autopsy found extensive bruising on the back of the child's neck and concluded that he died of asphyxiation. In the past ten years, there have been at least four other exorcism-related deaths in the United States, two of the victims children (see "Autistic Boy Killed During Exorcism," November/December 2003 SI). There are even more murders caused by belief in demons, such as those of Texas mothers Andrea Yates (who drowned three of her children in an effort to exorcise the devil from herself in 2001) and Dena Schlosser (who cut the arms off of her eleven-month-old girl while listening to religious hymns in 2004).

A film about an exorcism death is scheduled to appear in theaters in September. *The Exorcism of Emily Rose,* starring Laura Linney and Campbell Scott, was "inspired by true events" surrounding a priest accused of negligence resulting in the death during an exorcism of a nineteen-year-old woman. The real event reportedly occurred in Bavaria in the 1970s.

—Benjamin Radford

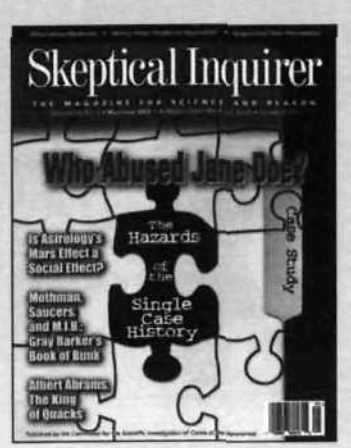
Benjamin Radford is managing editor of the SKEPTICAL INQUIRER.

PBS Series *Nova* to Feature 'Einstein's Big Idea'

On Tuesday, October 11, 2005, the PBS series *Nova* will broadcast an episode titled "Einstein's Big Idea," which will not only document Einstein's formulation of the equation that has become his most recognized contribution to physics but will also dramatize the lives and work of four centuries of thinkers whose work led to that iconic moment in the history of modern science.

The program is based on David Bodanis's book, $E = mc^2$, a bestseller published in 2000. Einstein is played by Aidan McArdle in scenes that are set during that milestone year, 1905, when Einstein published the paper where $E = mc^2$ first appeared, "Does the Inertia of a Body Depend on Its Energy-content?" in the German journal of physics, *Annalen der Physik.*

More information on the program is available on the Web at www.pbs.org/wgbh/nova/einstein/index.html.


Skeptical Inquirer
Who Abused Jane Doe?
The Hazards of the Single Case History
Case Study
Is Astrology's Mars Effect a Social Effect?
Mothman, Saucers, and M.I.B.: Gray Barker's Book of Bunk
Albert Abrams, The King of Quacks

'Jane Doe' Recovered Memory Lawsuit Appeal

The SKEPTICAL INQUIRER published a two-part article in 2002 questioning psychologist David L. Corwin's use of a single case study as proof that victims of traumatic experiences repress memories. In the May 1997 issue of *Child Maltreatment,* Corwin published the findings from his study of his patient known as "Jane Doe."

Corwin first interviewed Jane in 1984 when, at the time of her parents' battle for custody, she accused her mother of sexual abuse. When he followed up on her case in 1995, Corwin discovered that she had little memory of the past trauma. He then showed Jane the videotape of her at age six describing the abuse, a tape he had been using at various conferences, and the supposed memories of the events came back to her. Corwin concluded that Jane had "repressed" the memories.

Corwin's theories based on Jane's case became almost instantly controversial. Psychiatrists began using the term "memory wars" to describe the debate over the validity of his repressed memory theory. Elizabeth Loftus, a renowned psychologist and CSICOP Fellow, and Melvin Guyer, of the Department of Psychology, University of Michigan, then became interested in the case.

In their SKEPTICAL INQUIRER article, "Who Abused Jane Doe?" (May/June and July/August 2002), Loftus and Guyer wrote about their examination of Corwin's methods and interviews that had been conducted with Jane's surviving relatives, who had been involved in the legal proceedings surrounding the case.

Their research revealed that many officials involved in the divorce and custody disputes doubted the validity of the claims based on the nature of Jane's testimony and the lack of physical evidence of abuse. The authors also believed Corwin's study to have been one-sided, favoring the father, and that it did not take into consideration the testimony of the other family members. The authors asserted that in cases involving children, false memories could be created without the child's awareness due to the power of suggestion. They also emphasized that custody cases are particularly prone to false abuse charges.

Jane Doe filed suit against Loftus and Guyer, CSICOP, the SKEPTICAL INQUIRER, the Center for Inquiry–*West,* and others including Carol Tavris, who wrote a companion article to "Who Abused Jane Doe," for invasion of privacy and defamation of character. Doe's real name is Nicole Taus, now twenty-six and serving in the U.S. Navy. The lawsuit accuses Loftus of developing a personal and unprofessional relationship with Taus's mother, reporting on supposedly confidential court records, and using deceit to obtain interviews.

The San Francisco Court of Appeal ruled in April 2005 that Loftus may have defamed Taus when she allegedly said in a 2002 lecture that "Jane Doe" engaged in destructive behavior after viewing the tape; the court reasoned that from her statements it might be inferred that Taus was unfit for service.

Loftus, Guyer, Tavris, and the CSICOP defendants filed an appeal and are waiting to see if the case will move to the California Supreme Court. The defendants are hoping to clarify the applicability of privacy laws to academic and journalistic research in cases like that of Jane Doe.

Other psychologists and psychiatrists have stated that "the manner in which people remember and report past traumatic events is one of the most controversial issues confronting the mental health field today. If scientists can be sued for pursuing research, then the scientific method and all the fruits of scientific endeavors are under grave threat."

[Editors Note: The California Supreme Court has now granted CSICOP defendants' request for a review of the case.]

—Kim Stewart

Tom Cruise, Scientology Bash Psychiatry; APA Fires Back

> "It is irresponsible for Mr. Cruise to use his movie publicity tour to promote his own ideological views and deter people with mental illness from getting the care they need."

So states Dr. Steven Sharfstein, president of the American Psychiatric Association (APA), in response to recent talk show activities of actor Tom Cruise. Weeks earlier, Cruise had criticized actress Brooke Shields for taking anti-depressants for postpartum depression. Cruise believes all psychiatry to be pseudoscience, chemical imbalances to be imaginary, and all psychotropic medication and therapy to be unnecessary and dangerous. His solution to the roller coaster of life? The Church of Scientology.

The topic arose while Tom Cruise was promoting the alien-invasion film *War of the Worlds.* Because celebrity opinions can carry great weight with fans, Cruise's comments worried many in the mental health field. In an appearance on the *Today Show,* Cruise proclaimed a profound understanding of psychiatry that reinforced his belief that the field was bogus. The gist of Cruise's message was that mental illness was not real and that people should not look to psychology for help. The APA responded with the following statement:

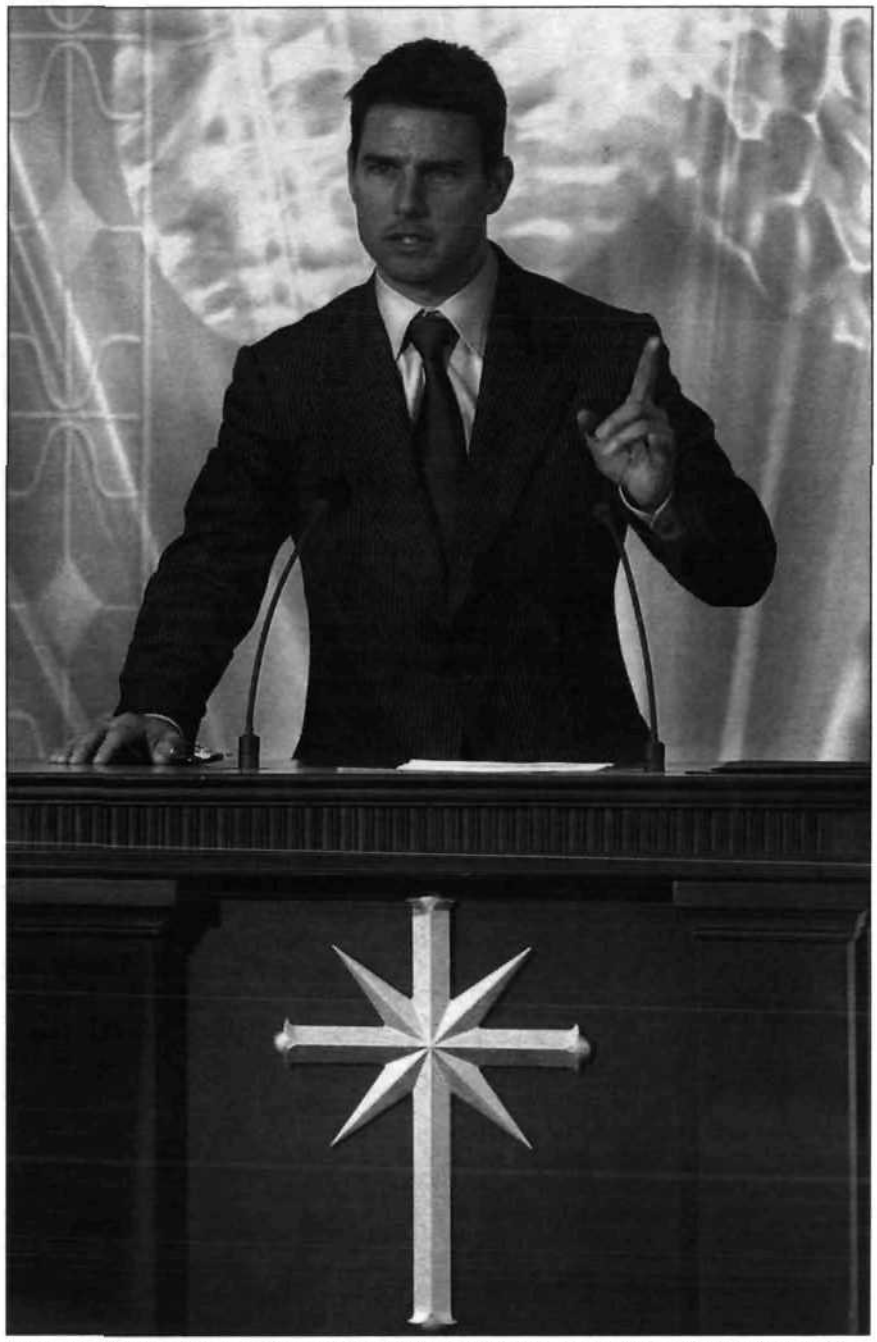
> Science has proven that mental illnesses are real medical conditions that affect millions of Americans. . . . Over the past five years, the nation has more than doubled its investment in the study of the human brain and behavior, leading to a vastly expanded understanding of postpartum depression, bipolar disorder, and attention-deficit/hyperactivity disorder. Much of this research has been conducted by the National Institutes of Health and the nation's leading academic institutions. Safe and effective treatments are available and may include talk therapy, medication, or a combination of the two. Rigorous, published, peer-reviewed research clearly demonstrates that treatment works.

> Medications can be an important and even life-saving part of a comprehensive and individualized treatment plan. As in other areas of medicine, medications are a safe and effective way to improve the quality of life for millions of Americans who have mental health concerns. Mental health is a critical ingredient of overall health. It is unfortunate that in the face of this remarkable scientific and clinical progress that a small number of individuals and groups persist in questioning its legitimacy. . . .

Brooke Shields also responded: "To suggest that I was wrong to take drugs to deal with my depression, and that instead I should have taken vitamins and exercised shows an utter lack of understanding about postpartum depression and childbirth in general. If any good can come of Mr. Cruise's ridiculous rant, let's hope that it gives much-needed attention to a serious disease."

Shields wrote a book on her experiences, *Down Came the Rain: My Journey Through Postpartum Depression*, in which she states: "I wasn't thrilled to be taking drugs. In fact, I prematurely stopped taking them and had a relapse that almost led me to drive my car into a wall with Rowan [her newborn] in the backseat. But the drugs, along with weekly therapy sessions, are what saved me—and my family."

Scientology, a movement based on the science fiction novels of L. Ron Hubbard, claims the notion of mental illness is a fraud and a scam. Hubbard himself equated psychiatrists with terrorists. Since the publication of Hubbard's self-help treatise *Dianetics* in 1950, the American Psychological Association has warned people of the potential danger of scientology's professed "cure." In 1969 the Church of Scientology founded the Citizens Commission on Human Rights, an organization designed to "investigate and expose psychiatric violations of human rights." In an informative article entitled "Scientology's war on psychiatry" (available at salon.com), Katharine Mieszkowski reports:



Actor Tom Cruise at the opening of the new Spanish headquarters of the Church of Scientology. (Photo credit: EPA/J.J. Guillén)

> Recently, Scientologists have promoted legislation in Florida, Utah and New Hampshire that seeks to discredit psychiatry and drug therapies, especially for kids. The laws would penalize, even criminalize, schoolteachers who recommended mental health treatments to students or parents.

Those speaking on behalf of Scientology in the Florida courts included actors Kelly Preston and Kirstie Alley. Those speaking against were trained scientists and mental health practitioners. A Scientology-backed program, Narcanon, has been touring public schools lecturing to children about the danger of recreational drugs. According to the Scientology handbook, "Answers to Drugs," the core treatment for those who abuse drugs like marijuana, Ecstasy, or

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BUILDING NEW FOUNDATIONS . . . Center for Inquiry staff members pose by the new addition's foundation.

The Center for Inquiry–*Transnational* announces a major, 13,600-square-foot expansion at its Amherst, New York, headquarters. Slated for completion during 2005, the $2.54 million expansion will more than double conference and seminar capacity, add ten urgently needed new offices, and enlarge the Center's world-class libraries. This capital project will relieve serious overcrowding and capacity problems, supporting projected program growth of the Center and its affiliate organizations, including the Council for Secular Humanism, for years to come.

We are literally bursting at the seams, and cannot continue program growth without expanding our headquarters. The shelf space of our humanist and freethought library – the finest in the world – is full. Yet donated books, magazines, and archival materials keep coming. There's an office or workstation everywhere we can put one, yet program and staffing needs continue to grow. Our existing conference and seminar space, opened in 1995, is often overwhelmed by larger and more complex events.

The headquarters expansion is one focus of our $26.26 million New Future Fund capital campaign. Your gift to the New Future Fund today will help to make our desperately needed headquarters expansion a reality. We seek gifts of cash, publicly traded securities, paid-up insurance policies, and other assets. Attractive incentive and naming opportunities are offered in acknowledgment of larger gifts. All gifts are fully tax-deductible as provided by law. Please join us and declare your support. Write, call, e-mail, or send in the bound-in postcard today!

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cocaine is sweating out drug residuals and other toxins by taking saunas and jogging. Remedies also include the B-complex vitamin niacin, oils and other minerals, a detoxification service which "is available under expert supervision in Scientology organizations and missions around the world."

While there is an ongoing debate within society about the use of medication, especially by children, scientific organizations are an integral part of this discussion. Contrary to what the Scientologists claim, medication is not always diagnosed as the most effective treatment. Psychiatrists and psychologists work with an individual to tailor a mental health program to fit his or her needs; in many cases medication has been found to be very effective.

Mark Plummer, a former Scientology member for fourteen years, states:

"Their goal is to take over entirely the field of mental health. Their beliefs stem from Hubbard's dogma that psychiatry is evil. Scientology teaches that psychiatry views people as 'meat bodies' without a spiritual aspect, and that Scientologists alone should be allowed to treat mental illnesses." Church leader David Miscavige agreed, stating quite clearly at the International Association of Scientologists in Copenhagen: "Objective one—place Scientology at the absolute center of society. Objective two—eliminate psychiatry in all its forms."

—Amanda Chesworth

Amanda Chesworth is CSICOP's Educational Director. □

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Beware of Quacks at the WHO
Objecting to the WHO Draft Report on Homeopathy

CEES N.M. RENCKENS, TOM SCHOEPEN, AND WILLEM BETZ

Even though the World Health Organization (WHO) has no international power, it still enjoys great authority all over the world. In the past, its initiatives and resolutions have always been able to bear the test of scientific criticism, based as they were on rational conceptions.[1]

However, the situation has changed. In the 1970s, the WHO lent a too-willing ear to acupuncture. The tide has not exactly turned on this tradition. In May 2002, the report *Traditional Medicine Strategy 2002–2005* was published. Strangely enough, this report also included alternative forms of medicine which are very popular in the West. The man responsible for this strategic report is Dr. Xiaorui Zhang, who is in charge of two WHO departments that—curiously—merged together: the Department of Essential Drugs and Medicine Policy and the Department of Traditional Medicine.

According to a press release, the report presents "the first global strategy on traditional and alternative medicine." It is a very pro-alternative report, recommending the issuance of rules and government policies with regard to alternative medicine, bypassing, for instance, the usual methods of testing medicine by accepting "assumed safety" after sustained use. A substantial part of this report was written by the World Federation of Chiropractic (WFC) and the World Self-Medication Industry (WSMI), which represents manufacturers and distributors of nonprescription medicines—that is, over-the-counter medicines—two organizations that are not exactly known as promoters of evidence-based medicine. Resentment against "Western medicine" is tangible on every page. Countries like China, North and South Korea, and Vietnam are praised as having fully integrated traditional medicine into their health systems. The indigenous flora of such regions are conceived of as rich and so far uncultivated sources of new remedies, from whose supposed benefits only the Third World countries should derive the profits. For example, the South African plant *Sutherlandia microphyllia* is claimed to be a promising medicine that helps increase the weight of AIDS patients.

Since 2002, Dr. Xiaorui has persevered, and the situation is getting worse. In 2003, the WHO issued *Acupuncture: Review and Analysis of Reports on Controlled Clinical Trials.* This review circumvented public evaluation and totally avoided the peer-review system.

Indiscriminate Medicine

The consequences are grave. Showing great contempt for the prevailing view in medicine, the report touts the effectiveness of acupuncture for, among other ailments, acute dysentery, hay fever, high blood pressure, rheumatoid arthritis, white-blood-cell deficiency caused by chemotherapy, colic caused by gallstones, strokes, and sciatica. The very pursuit of a recommendation to apply acupuncture in the case of dysentery—a dangerous and not infrequently lethal infection—would cost many lives.

Only few people are aware of the insignificant legal and medical status of such reports; little wonder that quacks are very eager to loudly proclaim the content of this report. The label "Recognized by the WHO" inspires misplaced confidence.

Meanwhile, news of preparations for a similar report, this time on the subject of scientific research on homeopathy, have leaked out. By chance, we were able to take a look at this secret draft report, which was handed around to a number of unknown experts by Xiaorui in November 2004. We immediately conveyed our objections to him. An answer remains forthcoming, and that's why we feel compelled to raise the alarm over this, before the WHO actually proceeds to publish.

A letter that accompanied the draft states that it "is intended for a restricted audience only" and that the draft text "may not be reviewed in any form or by any means outside the restricted audience." Comments were to be sent before the end of January 2005. Reading this draft report reveals why this secrecy is required. The tenor of *Homeopathy: Review and Analysis of Reports on Controlled Clinical Trials* is no better than the content of the report on acupuncture. The report refers to the infamous research of Jacques Benveniste on water-memory effects. Indeed,

Willem Betz and Tom Schoepen are committee members of SKEPP (Belgian Study Group on the Critical Evaluation of Pseudoscience and the Paranormal (www.skepp.be/). Cees N.M. Renckens is the chairman of the Dutch Association against Quackery (www.kwakzalverij.nl).

Benveniste's study did make it to *Nature* (with serious reservations by the editor), but there's not a word on the subsequent revocation of that same article.[2]

The draft report also indiscriminately adopts the ill-quoted conclusion of German scientist Klaus Linde, whose research was published in *The Lancet* in 1997. Linde stated that the clinical effects of homeopathy could not be entirely attributed to the placebo effect. (Linde has since renounced this conclusion.) But he also added that he had not found a single piece of evidence that homeopathy clearly works. The WHO clearly applies a method which countless homeopaths also use: selective critical thinking.

'Factually Wrong' and 'Problematic'

With regard to homeopathy, the draft report presents some indications for which effectiveness is claimed to be *proved: tropical diarrhea among children*, hay fever, beginning influenza, fibromyalgia, stomatitis during chemotherapy, and postoperative ileus, among others. Also, senseless explanations are brought up to support the supposed effectiveness of submolecular diluted solutions. The statements on the importance of agitation during the preparation of homeopathic remedies are downright hilarious.[3]

As in the report on acupuncture, critical reviews by the most influential authors/authorities that are specialized in scientific research on alternative treatments—the Web site Bandolier (Oxford University), the Cochrane Library, and Edzard Ernst (Exeter University)—are entirely ignored. In fact, Ernst considers the report to be "misleading and factually wrong."

Even more damaging to the credibility of the WHO report is the recent opinion of Klaus Linde, ironically, the most cited author in the same report. He considers the draft report on homeopathy as "overoptimistic" and would find it "problematic" if this would be circulated as an official WHO paper.[4]

Science by Majority Vote?

When it comes to health, what is decisive for the WHO—popular belief or expertise? As a matter of fact, it looks as though the majority opinion among the Third World countries in the WHO is the deciding factor and the organization's policies on some alternative remedies are determined by popular vote. If the application of holy water and irradiated tomatoes for the treatment of athlete's foot becomes popular, will the WHO also buckle under arguments of popularity? Listing the category "experience-based medicine" alongside the category "evidence-based medicine" is plainly misleading. For centuries, experience made people believe that treatments like bloodletting were excellent for one's health—until someone decided to scrutinize this claim.

The contempt for scientific standards in the evaluation of alternative and traditional medicine has disastrous consequences for the reputation and authority of the WHO, and leads to a considerable increase in quackery.

By legitimizing acupuncture while at the same time asking for "more research," the WHO is blowing hot and cold, creating a dangerous precedent. Also, the too-favorable judgment of "traditional medicine" by the WHO definitely won't alleviate the urgent need for rational and effective medicine in the Third World. It is very important that the WHO office realize that its documents are scrutinized. The quack lobbies that have infiltrated the WHO cannot be given a free ride. We ask all scientific and skeptical organizations to contact their health officials to let the WHO know that they expect the highest scientific standards to be applied in all official WHO statements on medicine.

Furthermore, the WHO's recommendations for methods of treatment should no longer be made by a majority vote but instead be based on a set of undisputed scientific criteria. Contributors to WHO reports should be above any suspicion of conflicts of interest. We also insist that *Dr. Xiaorui should put any future draft* reports under review by experts. In our opinion, a degradation of the WHO standards presents a sad and dangerous situation.

Notes

1. Since its foundation in 1948, the WHO has been publishing strategic documents in which it addresses global health problems and announces its plans. The 1977 report *Action Programme on Essential Drugs*, which listed 300 essential medicines and vaccines, is a good example. Since 1986, this action program has become part of the WHO strategy on the rational use of drugs, pleading in addition for national regulations on the registration of medicines, more schooling and exchange of information, [reduction/elimination] of deceptive drug advertising, and more research on tropical diseases. Another important report was *Health for All in the Year 2000*, which was the result of a conference in Alma Ata, Kazakhstan, in 1978. The recommendations in this document were undisputed and included the guideline that developing countries should spend at least 5 percent of their gross national product on health care.

2. About Benveniste, the report says: "A study published by a group led by Benveniste (Davenas

In the United States or Canada, the names and addresses of the officials to contact to put pressure on the WHO to stop promoting medical pseudoscience and to encourage the application of scientific medicine in all regions of the world are:

Michael O. Leavitt, Secretary
The United States Department of Health and Human Services
200 Independence Avenue S.W.
Washington, D.C. 20201

Telephone: (202) 619-0257
Toll free: 1-877-696-6775

The Honorable Ujjal Dosanjh,
Federal Minister of Health
Health Canada
A.L. 0900C2
Ottawa K1A 0K9

Telephone: (613) 957-2991
Toll free: 1-866-225-0709
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1988) attracted wide attention. . . . Although these studies have proved irreproducible, subsequent studies using a modified method . . . have shown positive results, which have been reproduced by several different laboratories. . . ." One of the studies quoted was from Belon et al. in 1999. This study was the subject of a carefully conducted experiment by the BBC and proved not to be able to demonstrate any specific effects of ultra-diluted solutions, contrary to the unequivocal assertions. Neither the immediate refutation by Davenas et al., the subsequent one by Hirst et al., nor the invalidation by the BBC are mentioned in the report.

3. About the role of agitation (shaking and knocking), the report states: "Theoretical work predicts that a body of water containing about 10^{15}–10^{17} molecules will spontaneously self-organise into a 'coherent domain' similar to electrons in a free electron laser (Del Giudice 1988). It appears that such coherent domains could be triggered by the process of dilution and agitation used in the preparation of homeopathic medicines."

Similar wording can be found in the February 2002 edition of *Chembytes*, the monthly e-zine of homeopath and chemist Lionel Milgrom, who is quoted in the draft report although he is not recorded in the bibliography.

Obviously, all this has nothing to do with the "clinical trials" in the title of the draft report. What this nonsense conceals, however, is that the quoted article is not at all concerned with fixed structures that exist long enough to be replicated but rather with the eventuality that the movements of the rotation axes of free-water molecules show a certain connection. It is a fact that water molecules are generally stuck to one or more neighboring molecules with hydrogen bonds. Structures that come into being in this way have a life span of about 10^{-14} seconds and during the same duration, any pattern in the random movements of the molecules crumbles away. This temporarily shared movement shows no preferential direction, but Del Giudice speculates that it might arise in the vicinity of substances with a charge distribution (like proteins). However speculative this may sound, Del Giudice does not comment on any effect of agitation (shaking) and dilution. Nor is it evident how this mechanism would take effect in alcohol or lactose (the vehicles most often used for homeopathic solutions). After all, it remains unclear how the effect of knocking a vial on a leather-bound book (*Organon of Medicine* § 270, note 3) could have the slightest effect on molecules that constantly bump into each other at speeds of hundreds of meters per second.

This appeal to the highly speculative article of Del Giudice et al. can be treated in the same way as the "proof" of Hahnemann that links a personal observation about the intoxicating smell of roses with an anecdote about the Byzantine emperor Alexius, who passed out and was restored to consciousness with rose water by his sister (*Organon of Medicine* §117, notes 1 and 2).

4. E-mail message from Klaus Linde to Willem Betz.

Mystical Experiences
Magnetic Fields or Suggestibility?

JOE NICKELL

Some skeptics have embraced Michael A. Persinger's studies which supposedly demonstrate that electromagnetic stimulation of the brain *can produce religious or paranormal* experiences. Persinger's findings received extensive media attention, including television coverage by the BBC, CNN, and the Discovery Channel, in addition to numerous citations in print, especially in popular science magazines. Recent experimental results, however, cast doubt on Persinger's claims.

Persinger—a professor of psychology and biology at Laurentian University in Sudbury, Ontario, Canada—has claimed that a majority of test subjects (up to 80 percent) sense an unexplained presence when their temporal lobes are targeted by weak magnetic fields. Skeptics have been tempted to argue from Persinger's work that certain paranormal experiences may merely be due to brain stimulation. Supposedly, sightings of ghosts, angels, and aliens, as well as out-of-body experiences might all be caused by exposure to electromagnetic fields (as from electronic equipment or power lines) or Earth's geomagnetic fields (Roll and Persinger 2001; Shermer 2003; Granqvist et al. 2004).

Others (including myself) were troubled by some of Persinger's writings, such as "Investigations of Poltergeists and Haunts: A Review and Interpretation," co-authored with parapsychologist William G. Roll (Roll and Persinger 2001). This work suggests, for instance, that some *poltergeist* ("noisy spirit") disturbances that skeptical investigators have attributed to human tricks or other mundane causes (Christopher 1970, 142–163; Randi 1985; Randi 1995, 52–53, 186; Baker and Nickell 1992, 135–139; Nickell 2001) may instead be due to "a psychoenergetic force." The two collaborators opine that, possibly, "electromagnetic components of mental states can interact with electromagnetic energy in the environment to produce the events" (Roll and Persinger 2001, 152).

In late 2004, however, a joint study by scientists from two Swedish universities called into question much of Persinger's research. The scientists attempted to replicate Persinger's findings using the identical magnetic-field apparatus. Their experiments involved eighty-nine students in psychology and theology.

The researchers found no evidence that paranormal or religious experiences were caused by the electromagnetic stimulation. However, there were such reported experiences in both the test and control group subjects who were highly suggestible (as determined by use of a special questionnaire). The researchers

Joe Nickell, CSICOP's Senior Research Fellow, is author of numerous investigative books including The Mystery Chronicles: More Real-Life X-Files.

concluded that "suggestibility may account for previously reported effects." To explain the discrepancies between their results and those of Persinger and his co-workers, the Swedish scientists noted that the previous studies were not clearly double blinded. (To avoid influencing the results, neither the test subjects nor experimenters should know who was exposed to the weak magnetic fields and who was not.)

Persinger countered that some of his studies were effectively double blinded, and that the Swedish researchers did not expose their test subjects to magnetic fields for a sufficiently long time (Khamsi 2004). That seems an odd claim, since the scientists sought specific instruction from Persinger and his co-worker, Stanley Koren, with regard to optimal replication (Granqvist et al. 2004).

Clearly, the claim that application of magnetic fields can prompt certain mystical experiences has been seriously challenged. On the other hand, the Swedish results further demonstrate the powerful role suggestibility plays in such experiences. As the researchers commented, regarding commercially available devices that produce weak complex fields (devices that, while having a different design, function on the same principles as the one used in the various studies), ". . . [I]nsofar as prospective purchasers of such equipment are high on suggestibility, placing the helmet or their heads in a sensory deprivation context might have the anticipated effects, whether or not the cord is plugged in" (Granqvist et al. 2004).

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Roll, William G., and Michael A. Persinger. 2001. Investigations of poltergeists and haunts: a review and interpretation. In Houran and Lange 2001, 123–163. □

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Italy's 'Miracle' Relics

In October 2004, after participating in the Fifth World Skeptics Congress in Abano Terme, Italy—near Padua, where Galileo taught and discovered Jupiter's moons (Frazier 2005)—I remained in the beautiful country for some investigative work. Here are some of my findings.

Relics of the Saints

I was able to visit a number of churches containing alleged relics—objects associated with a saint or martyr. These may be all or part of the holy person's body (in Catholicism, a *first-class relic*) or some item associated with him or her (such as an article of clothing, a *second-class relic*). Venerated since the first century A.D., relics were thought to be imbued with special qualities or powers—such as healing—that could be tapped by one touching or even viewing them (Pick 1979, 101).

Figure 1. A lighted-cross reliquary in a Turin church purportedly contains a piece of the True Cross and some of the Holy Blood of Christ. (Photo by Joe Nickell)

So prevalent had relic veneration become in St. Augustine's time (about A.D. 400) that he deplored "hypocrites in the garb of monks" for hawking the bones of martyrs, adding with due skepticism, "if indeed of martyrs" (qtd. in "Relics" 1973). About 403, Vigilantius of Talouse condemned the veneration of relics as being nothing more than a form of idolatry, but St. Jerome defended the cult of relics—on the basis of miracles that God reputedly worked through them ("Relics" 1967).

Here and there were such relics as the fingers of St. Paul, St. Andrew, and the doubting Thomas. There were multiple heads of John the Baptist. Especially prolific were relics associated with Jesus, whose foreskin was enshrined at no fewer than six churches. There were also his swaddling clothes, hay from the manger, and vials of his mother's breast milk. A tear that he shed at Lazarus's tomb was also preserved, along with countless relics of his crucifixion and burial (Nickell 1993, 75–76).

Italy is especially rich with relics. With the generous assistance of my Italian friends, who relayed me from city to city by train across the northern part of the country, I witnessed reputed holy relics in Vienna, Milan, and Turin (before later flying to Naples).

In Venice, beneath the high altar of the Basilica di San Marco (St. Mark's Basilica), supposedly lies the body of the author of the gospel of Mark, martyred in Alexandria and later brought to the city by Venetian merchants. Some Italian colleagues and I visited the cavernous Byzantine basilica on October 11, first paying to see a collection of relics that included an alleged piece of the stone column of Jesus' flagellation, then paying again to pass by St. Mark's reputed remains.

Unfortunately, since the remains did not come to Venice until A.D. 829 (whereupon construction of the basilica was immediately begun to enshrine them), there is a serious question as to their *provenance* (or historical record). Even accepting the substance of the story about their acquisition, one source

Joe Nickell is author of numerous books including Inquest on the Shroud of Turin *and* Looking for a Miracle. *He is presently at work on* Relics of the Christ.

notes, "the identity of the piously stolen body depends on the solidarity of the Alexandrine tradition" (Coulson 1958, 302). Moreover, according to a National Geographic Society travel guide (Jepson 2001, 143), "many claim the saint's relics were destroyed in a fire in 976."

In Milan, I visited the Basilica of St. Eustorgio, my guide being noted writer (and fellow SI columnist) Massimo Polidoro. In a dark recess of the church we read the inscription, "SEPVLCRVM TRIVM MAGORVM" (Sepulcher of the Three Magi). A carved stone slab nearby was accompanied by a sign that informed, "According to tradition this stone slab with the comet was on top of the Magi's tomb and was brought to Italy along with their relics." Actually the story is a bit more complicated.

Legendarily, the relics were discovered by St. Helena (248–328), mother of Constantine the Great. They were supposedly transferred to Milan by St. Eustorgio (d. 518) who carried them by ox cart. Then after Milan fell to Frederick Barbarossa in 1162, they were transported to Cologne two years later (Cruz 1984, 154; Lowenthal 1998).

It appears, however, according to an article by David Lowenthal titled "Fabricating Heritage" (1998), that the relics were never in Milan. Instead it seems that the whole tale was made up by the Cologne archbishop, Reinald of Cologne. In any event, in 1909, some fragments of the alleged Magi bones were "returned" to Milan and enshrined in the church named for their legendary transporter, the sixth-century bishop of Milan.

In Turin, I visited important "relic" sites. One, the Cathedral of St. John the Baptist, houses the notorious Shroud of Turin, the supposed burial cloth of Christ that is actually a tempera-painted forgery, radiocarbon dated to the time of a confessed fourteenth-century artist. With a small group of Turin skeptics, I also studied the latest shroud developments at the Museo della Sindone (Holy Shroud Museum) along with many items associated with the cloth, including the mammoth camera with which it was first photographed in 1898. (For more on the Shroud see Nickell 1998; McCrone 1996).

Elsewhere in Turin, I visited the Church of Maria Asiliatrice, whose crypt is a relic's chapel, containing a fabulous collection: an estimated five thousand relics of saints! There are endless panels and display cases of them along the walls including relics alleged to be from Mary Magdalene and, more credibly, St. Francis of Assisi.

The focal point of the chapel (figure 1) is a lighted cross containing, purportedly, a small amount of the Holy Blood of Christ. As with other such blood relics, however, there is no credible evidence to link it with Jesus or even with his time. With the blood is, purportedly, a piece of the True Cross discovered due to a vision by St. Helena in 326. Protestant reformer John Calvin in his *Treatise on Relics* (1543, 61) stated there were enough alleged fragments of the cross to "form a whole ship's cargo."

Figure 2. Statue of Faith holding the Holy Grail stands before the Gran Madre di Dio church in Turin. According to legend, this is the site where the Holy Grail is hidden. (Photo by Joe Nickell)

Because such relics were eagerly sought by noblemen and churches alike in order to enhance their influence, there were always those willing to supply them—even if by unholy means.

The Catholic Church has addressed the question of authenticity of relics in something less than a head-on-fashion. It often sidesteps the issue by avoiding taking a position regarding the genuineness of a particular relic. The veneration of certain doubtful relics was permitted to continue on the grounds that, even if a relic was in fact spurious, God was not dishonored by an error which had been continued in good faith, whereas it was felt that a final verdict could not easily be pronounced in the case of many relics. Besides, it was argued, the devotions "deeply rooted in the heart of peasantry" could not lightly be dismissed (Christian relics 2004). Thus an end-justifies-the-means attitude—which helped create and promote fake relics in the first place—prevailed.

Holy Grail, Holy Hoax

In Milan and Turin I visited sites that have gained new interest due to the runaway popularity of Dan Brown's *The Da Vinci Code* (2004). The novel presents a modern-day quest for the Holy Grail, the legendary cup Jesus and his disciples drank from at the Last Supper and that was also subsequently used to catch and preserve his blood at the crucifixion (figure 2). That act was usually attributed to Mary Magdalene or Joseph of Arimathea. The original grail story is the French romance, *Le Conte du Graal* (*The Story of the Grail*), composed about 1190 by Chrétien de Troyes (Barber 2004, 17–19).

Brown's novel is predicated on a conspiracy theory involving Jesus and Mary Magdalene. Supposedly the old French word *sangreal* is explained not as *san greal* ("holy grail") but as *sang real* ("royal blood"). Although that concept was not current before the late Middle Ages, a source Brown drew heavily on,

Holy Blood, Holy Grail, argues that Jesus was married to Mary Magdalene, with whom he had a child, and even that he may have survived the Crucifixion. Jesus' child, so the "non-fiction" book claims, thus began a bloodline that led to the Merovingian dynasty, a succession of kings who ruled what is today France from 481 to 751 (Baigent et al. 1996).

Evidence of the holy bloodline was supposedly found in a trove of parchment documents, discovered by Bérenger Saunière, the priest of Rennes-le-Château in the Pyrenees. The secret had been kept by a shadowy society known as the Priory of Sion which harked back to the era of the Knights Templar and claimed among its past "Grand Masters" Leonardo da Vinci, Isaac Newton, and Victor Hugo.

Brown seizes on Leonardo—borrowing from "The Secret Code of Leonardo Da Vinci," chapter one of another work of pseudo-history titled *The Templar Revelation*. This was co-authored by "researchers" Lynn Picknett and Clive Prince, whose previous foray into nonsense was their claim that Leonardo had created the Shroud of Turin—even though that forgery appeared nearly a century before the great artist and inventive genius was born!

Among the "revelations" of Picknett and Prince (1998, 19–21), adopted by Dan Brown in *The Da Vinci Code*, is a claim regarding Leonardo's fresco, *Last Supper*, which I visited in Milan with Massimo Polidoro. Supposedly, the painting contains hidden symbolism relating to the *sang real* secret. Picknett and Prince claim, for instance, that St. John in the picture (seated at the right of Jesus) is actually a woman—Mary Magdalene!—and that the shape made by "Mary" and Jesus is "a giant, spread-eagled 'M,'" allegedly confirming the interpretation. By repeating this silliness, Brown provokes critics to note that his characterizations reveal ignorance about his subject (Bernstein 2004, 12).

Alas, the whole basis of *The Da Vinci Code*—the "discovered" parchments of Rennes-le-Château, relating to the alleged Priory of Sion—were part of a hoax perpetrated by a man named Pierre Plantard. Plantard commissioned a friend to create fake parchments which he then used to concoct the bogus priory story in 1956 (Olson and Miesel 2004, 223–239).

Of course, Dan Brown—with the authors of *Holy Blood, Holy Grail* and *The Templar Revelation*—was also duped by the Priory of Sion hoax, which he in turn foisted onto his readers. He is apparently unrepentant, however, and his apologists point out that *The Da Vinci Code* is, after all, fiction, although at the beginning of the novel, Brown claimed it was based on certain facts. Meanwhile, despite the devastatingly negative evidence, *The Da Vinci Code* mania continues, along with the quest for the fictitious Holy Grail.

Figure 3. Luigi Garlaschelli, intrepid Italian paranormal investigator, poses with the Pozzouli Stone on which St. Januarius was legendarily beheaded. (Photo by Joe Nickell)

Blood of St. Januarius

Joined by paranormal investigator Luigi Garlaschelli (from the Department of Organic Chemistry at the University of Pavia), I flew from Turin to Naples to further investigate a miracle claim on which I had previously spent much time. It concerned the "blood" of the legendary martyr San Gennaro—St. Januarius—who was supposedly bishop of Benevento, Italy, in A.D. 305 when he was beheaded during the persecutions of Christians by Diocletian.

Eyewitnesses dating back to at least the fourteenth century reported that what is represented as the martyred saint's congealed blood periodically liquefies, reddens, and froths—in an apparent contravention of natural laws. The ritual takes place several times annually. According to tradition, if the phenomenon fails to occur, disaster is imminent (Nickell and Fischer 1992, 145–151).

Reasons for suspicions abound. First, the Church has never been able to verify the historical existence of San Gennaro. Moreover, there is absolutely no provenance for the saint's blood relics prior to 1389 (when an unknown traveler reported his astonishment at witnessing the liquefaction).

Another reason for suspicion is that there are additional saints' bloods that liquefy—some twenty in all—and virtually every one of them is found in the Naples area. Such proliferation seems less suggestive of the miraculous than indicative of some regional secret.

*It is important to note that no sus*tained scientific scrutiny of the blood relics has ever been permitted. Also, descriptions of the liquefaction vary, and it is not always easy to separate what may be permutations in the phenomenon's occurrence from differences attributable to individual perceptions. Assertions that the substance in the vials is genuine blood are based solely on spectroscopic analyses that employed antiquated equipment and that were done under such poor conditions as to cast grave doubts on the results. (For a full discussion of the Januarian legend and phenomena, see Nickell and Fischer 1992, 145–164.)

Forensic analyst John F. Fischer and I offered a solution to the phenomenon,

involving a mixture of olive oil, melted beeswax, and pigment. Only a small amount of the wax is added, sufficient that, when the whole is cool, the mixture is solid, but when slightly warmed (by body heat, nearby candles, etc.) the trace of congealing substance melts and—slowly or even quite suddenly—the mixture liquefies. As one authority states: "A very important fact is that liquefaction has occurred during repair of the casket, a circumstance in which it seems highly unlikely that God would work a miracle" (Coulson 1958, 239).

In 1991, before we could publish our research, a team of Italian scientists made international headlines with their own solution to the Januarian mystery. Writing in the journal *Nature*, Prof. Garlaschelli and two colleagues from Milan, Franco Ramaccini and Sergio Della Sala, proposed "that thixotropy may furnish an explanation." A thixotropic gel is one capable of liquefying when agitated and of resolidifying when allowed to stand. The Italian scientists, creating such a gel by mixing chalk and hydrated iron chloride with a small amount of salt water, reported a convincing replication of the Januarian phenomenon (Garlaschelli et al. 1991).

In 1996, Garlaschelli was able to examine a similarly liquefying blood relic, that of St. Lorenzo (at the Church of St. Maria in Arnaseno, Italy). Using a test-tube mixer, he whirled the ampoule containing the "blood" to test the thixotropic-gel hypothesis, but there was no effect. He then immersed the ampoule in warm water to test the melting hypothesis, whereupon a "miracle" occurred: the contents liquefied and turned red—just like the Januarian phenomenon (Polidoro 2004).

In 2004, in company with Luigi Garlaschelli himself, I was able to visit the Italian sites that hold the reputed relics of San Gennaro and to discuss all of this evidence. The sites included The Chapel of the Treasury, situated inside the Cathedral of Naples. This baroque chapel—rich in frescoes and marbles—holds the gilded silver bust of the saint and the ampuella of the "blood" that periodically liquefies and again coagulates. Garlaschelli (2004) cautions that the St. Januarius and St. Lorenzo "blood" relics do not necessarily work on the same principle, and he still believes the former may be a thixotropic substance.

We also visited The Church of Cappuchin Monks at Pozzouli, Italy, a short train ride from Naples. Here is the marble slab, installed in the church wall, reputed to be the stone on which Januarius was beheaded (figure 3). In the late 1980s, however, the stone was examined and determined to be a paleo-Christian altar, possibly dating from the seventh century (hundreds of years after the martyrdom). The red spots that were supposed to be blood of the saint are believed to be traces from an old painting together with some candle drippings. According to Garlaschelli (2004), the church itself now discourages the cult of The Pozzoli Stone, he says, "as a superstition originating from the wishful thinking and self-delusion of the worshippers." That could apply to many other miracle claims—throughout Italy and beyond.

The **red spots** that were supposed to be blood of the saint are believed to be traces from an old painting together with some **candle drippings.**

Acknowledgments

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The Power and Perils of Metaphors in Science

Humans apparently cannot avoid thinking, at least occasionally, by images and parallels to already known situations. The combination of mental imagery and logical parallels produces metaphors, and metaphors have played a crucial role in the development of human thought, from religious teachings to mystical "insights," from philosophy to science.

It is with the use of metaphors in science that I am particularly concerned here. They are all over the place, from physics to biology, used in both technical papers and nature documentaries. Think of early mental models of the atom as a miniature solar system; they were useful because they recast the unfamiliar microscopic in terms of the familiar macroscopic, making it easier for countless students and researchers to make sense of the data that were coming in from the experiments. The problem is, atoms are really not miniature solar systems, not even close; and if one insists on thinking of them that way, then it becomes next to impossible to account for the advances of quantum mechanics.

Massimo Pigliucci is Professor of evolutionary biology at SUNY-Stony Brook, a fellow of the American Association for the Advancement of Science, and author of Denying Evolution: Creationism, Scientism and the Nature of Science. *His essays can be found at www.rationally speaking.org.*

But I am not a physicist, so I will instead discuss a metaphor with which I am more familiar professionally, one that has spurred a large amount of discussion and research (both theoretical and empirical) in evolutionary biology. This is the idea of an "adaptive landscape," first proposed by American biologist Sewall Wright in 1932. Wright developed a complex mathematical model to describe how evolution by natural selection (and other means) can improve the fitness of populations of organisms to the environments they encounter. Wright's math, however, was a bit too complicated for most biologists, and his advisor asked him to develop a graphical representation of his ideas before an important international meeting: without the graphical model, Wright's ideas would not have been understood, and would have probably been ignored.

Wright then produced a series of drawings that eventually became the canonized version of the "adaptive landscape" metaphor (figure 1). An adaptive landscape can be drawn in three dimensions, with two of the axes representing the frequencies of two genes that are known to affect fitness, and the vertical axis quantifying the fitness of a population characterized by those gene frequencies. Adaptive landscapes are "rugged," that is they have "peaks" of high fitness (corresponding to the genetic combinations favored by natural selection) and "valleys" (areas of low fitness due to disadvantageous gene frequencies). It became immediately clear from staring at an adaptive landscape that evolutionary theory had an interesting problem to solve: suppose a population evolves toward the top of a local adaptive peak. How can that population move away from the peak, say to reach one that is part of the same landscape, but is higher (and therefore corresponds to increased fitness)? Natural selection alone cannot do the job, because it cannot predict the future and push a population down a maladaptive valley in order to cross it and then start climbing another peak. Wright introduced an ingenious theory to solve the problem of "peak shift," as it became known, a theory that involves complementary roles of random events in small populations (so-called "genetic drift") and natural selection. The problem is that decades of research on peak shifts has led most practitioners to conclude that Wright's solution to the problem is very unlikely to work in actual biological populations; moreover, there doesn't seem to be a better alternative around.

Some biologists have always been rather cold toward the whole adaptive landscape business, for a variety of good reasons. For one, real populations evolve

in ever-changing environments, which means that the configuration of adaptive landscapes itself ought to change. What was a peak yesterday may become a valley today, and vice versa, and valleys could be traversed simply by the fact that the peaks move around, rather than the populations. Furthermore, who's to say that evolution has to allow populations to always maximize their fitness? Natural selection is not an optimizing process (i.e., one that guarantees the best possible outcome), but rather a "satisfycing" one, capable of improving the organism-environment fit only locally. As if all of that were not enough, there is the significant problem that nobody has ever measured the characteristics of a real adaptive landscape: the whole thing is a figment of mathematical imagination with little or no empirical backing.

But wait! There is another potential problem with the metaphor itself: as Wright realized, and everybody else who works in the field knows, realistic adaptive landscapes are very highly dimensional (not just 3D), because there are thousands, or even tens of thousands, of genes that affect fitness. What do these multidimensional landscapes "look" like, or rather, since we can't visualize them, what are their biological properties? Sergey Gavrilets, at the University of Tennessee, has asked that question and produced a series of papers about multidimensional landscapes. It turns out that these are "holey" (as in, with holes, figure 2)—i.e., they are characterized by extensive ridges of relatively high fitness, punctuated by areas of very low fitness (the holes). The surprise was that there are no "peaks" in holey landscapes, and populations can "slide" over ridges of equal fitness, until natural selection pushes them on a higher level.

The point of Gavrilets's work is that it shows that a serious theoretical problem in evolutionary biology (how do populations shift from one adaptive peak to another?) turned out to be an artifact of the metaphor itself (and in particular of our inability to think in higher dimensions), just like certain properties of electrons couldn't possibly be explained by miniature solar system versions of atoms. Once the metaphor is abandoned and replaced by a more accurate one, however, old problems can be solved, and new research questions arise. Of course, "holey" landscapes themselves are an incomplete and imperfect metaphor (especially when they are projected on a 3D diagram like the one in figure 2), so we can expect another round of apparent problems, and a new push toward better models and metaphors. But that's the way science progresses. The landscape of truth is very rugged indeed. □

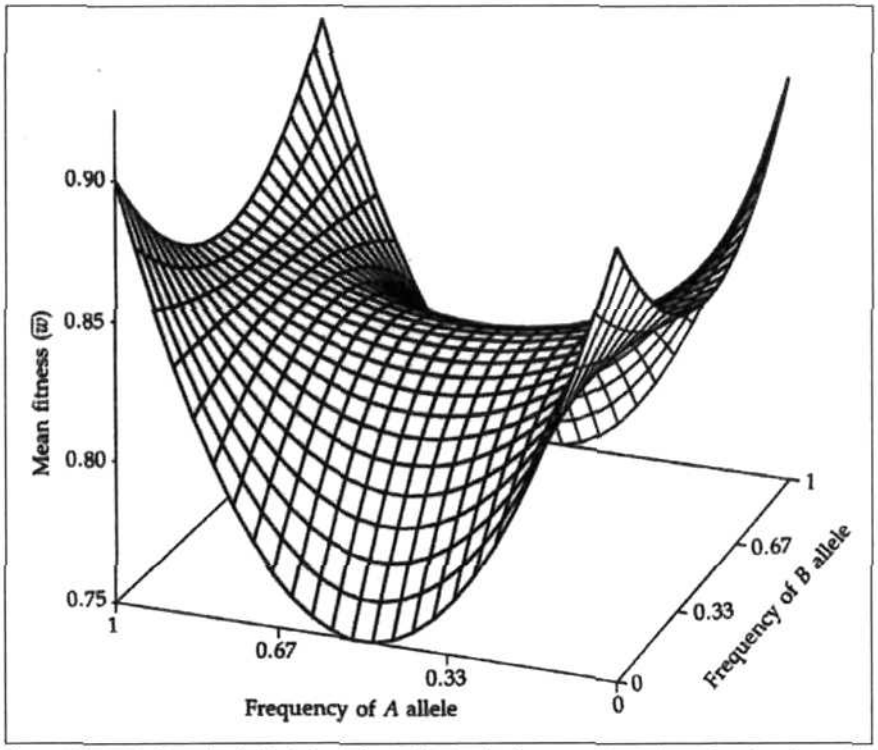


Figure 1. A typical textbook depiction of an adaptive landscape: a three-dimensional surface with the base plane identified by the frequencies of two alleles and the vertical axis representing a measure of (mean) fitness in a population. (From Hartl and Clark, *Principles of Population Genetics*, Sinauer, 1989, p. 215)

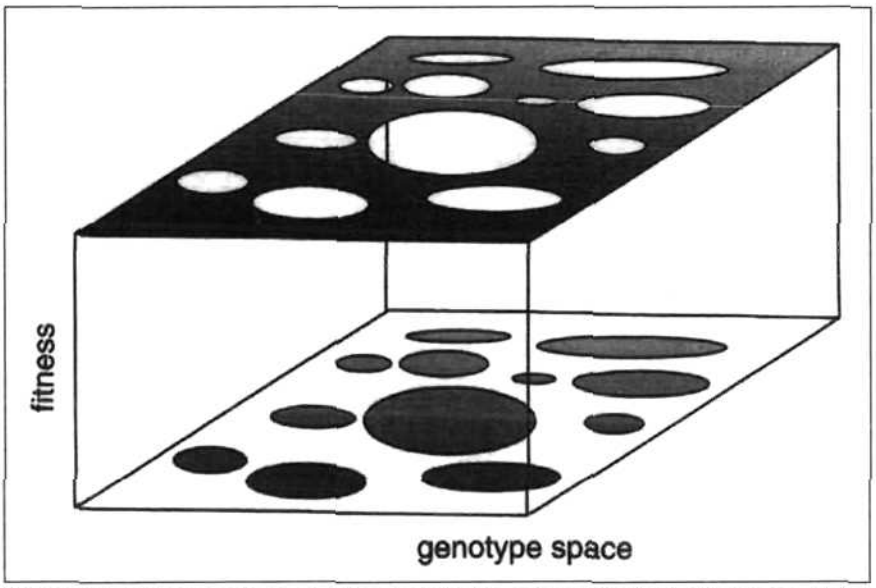
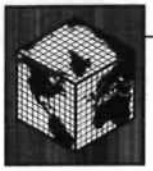


Figure 2. A low-dimensional representation of a holey landscape. Notice the low-fitness areas (holes) and in particular the fact that high-fitness areas are connected by continuous paths that make it possible for a population to cross the landscape without having to "jump" from a peak to another or to cross an adaptive valley. (From Gavrilets, "Evolution and speciation on holey adaptive landscapes," *Trends in Ecology & Evolution* 12, 1997, p. 309 with permission from Elsevier.)



Beware of Poltergeists

Poltergeist is a German word that literally means "noisy ghost." It is, in fact, believed that poltergeists make their presence known by throwing objects around, making rapping sounds, starting fires, or producing electrical disturbances.

The very first case I had a chance to investigate took place on January 22, 1989, right after the foundation of CICAP, the Italian skeptical organization. It was a case of a poltergeist.

The news media had devoted lots of time and space to the strange case of Marco, a twelve-year-old boy who lived in Milano with his parents, and who seemed to be at the center of some very mysterious happenings. Furniture would move around the house, pictures would fall off the walls, books would fly across the room, and so on. An exorcist was called, and also a psychic healer, a medium, and some parapsychologists, but no one had been able to bring peace back to the house. Since the birth of CICAP had attracted some media attention just a few weeks earlier, we were immediately called upon by journalists to investigate the case. However, it was only when the distressed family called on us that we decided to step in.

Massimo Polidoro is an investigator of the paranormal, author, lecturer, and cofounder and head of CICAP, the Italian skeptics group. His Web site is at www.massimopolidoro.com.

We knew from the previous experience of other skeptical groups and investigators like James Randi that most of the time, similar cases had revealed nothing paranormal. The phenomena usually had natural causes, like drafts of wind or tremors caused by the passage of heavy trucks. One of the most significant episodes we'd heard about was that involving the Resch family of Columbus, Ohio, where an adopted child, Tina, would cause strange phenomena, very similar to those in the Italian case we were going to investigate. A video camera left on inadvertently showed the girl in the act of throwing a lamp in the air and the case was closed.

A Broken Glass

We met with Marco's family on February 2 and decided on the following procedure: while a few members of the CICAP would talk with the parents, having them describe the whole story and trying to outline their psychological profile, I would spend time with Marco, while he played with his toys.

We spent three days with Marco and his family, and while nothing supernatural happened, several interesting facts came to light. First of all, the family appeared to be quite interested in psychic phenomena: there were several books on such subjects on their shelves, Marco had seen many movies that might have influenced him (*Poltergeist, The Exorcist, Nightmare on Elm Street,* etc.) and the parents had attended sèances and had consulted palm readers and other psychics in the past. Furthermore, there appeared to be some family tension because of the parents' demanding work schedules and their son's need for attention. What appeared to be most telling, however, was the fact that some members of the family had, more than once, caught Marco in the act of throwing things around.

"Oh, but that was nothing!" said the parents, explaining this revelation away. "Those times, he was only playing, but on every other occasion, the phenomena were real."

"What other occasions?" we asked. "Did anyone ever see a book take flight or a frame fall off the wall?"

Well, it appeared that nobody, except Marco, had ever seen any of the phenomena they reported occur from the beginning. At most, somebody had seen an object when it touched the ground, only because Marco had yelled to attract attention; however, usually the phenomena took place in the presence of only Marco, when he was alone in his room.

Those three days I spent with Marco showed me that he was an intelligent boy, with a good sense of humor but also very alert at watching all my movements. I was very careful never to leave him unobserved, and this resulted in no phenomena happening. The parents told us clearly that those were the first three days that had been devoid of

phenomena and could not explain why that was so. "Had the poltergeist run its course?" they asked.

On the last day, however, something did happen. I wanted to see if, given the opportunity, Marco would seize it, and so I relaxed my attention on him. I let him play and frequently turned my back to him. At one point during the evening, while we were playing with a computer game, he suggested that I keep on playing while he prepared his books for school. "Oh, don't worry," I said. "I can help you."

"No, no! Please," he insisted, "keep on playing. I'll be done in a second."

"Okay," I said. I turned around but managed to keep an eye on him by watching his reflection in a window. I watched him put some books in his bag and glance frequently at me. Then, he took something out of his bag and, with a sudden move, threw it against a wall. It was a drinking glass, and it shattered with a loud crash. I immediately turned around and asked, "Why did you do that?"

He looked at me quite puzzled: "What? What do you mean?"

"I saw you in the reflection," I explained. "Why did you throw that glass?"

"I . . . I . . . " he stammered.

He did not finish what he was saying, however, because his very excited father arrived in the room. "Did it happen? Did something happen? And you witnessed it, right?"

"No," I said. "I am sorry, but I clumsily bumped the glass and broke it."

"Oh, is that what happened?" he asked, a bit frustrated.

"Yes. I am very sorry."

The kid didn't look me in the face, but went on putting his books in the bag, silently. I had not wanted to embarrass him in front of his father and so had invented that excusable lie.

Our conclusion was that Marco was a normal kid who needed more attention from his parents and who one day had found that if he threw things around while nobody was watching him, he would get a lot of attention, not only from his parents but also from the news media and from quite a number of curious people who came to visit him. When I played with him and his toys, he couldn't care less about psychic phenomena and poltergeists, and in fact, nothing ever happened. Only when we announced that we were leaving did Marco "cause" something. Was it because he did not want his family to be thought liars or because he did not want us to leave? I don't know the answer. However, what is interesting is that from the day we left, the phenomena ended and Marco went on to become an adult.

That was not the only time I had to deal with claims of apparent poltergeist phenomena. In a case that took place shortly after that of Marco, a girl was thought to be a "firestarter," just like in Stephen King's novel: when she was angry, things around her would catch fire. It turned out that her mother had announced that a little sister was on the way, and the girl was not happy at all about it. Somehow, she had found a lighter around the house and used it to set fire to curtains, clothes, and blankets—to the horror of her parents. The whole family finally decided to consult a psychologist and was able to overcome its problems.

Both in this case and in that of Marco—as with some others of a similar nature—we did not reveal the full facts to the media. We thought that it was only fair to let the families solve their own problems by themselves, without the nosy curiosity of a videocamera.

A Dancing Panda

At other times, however, the explanation had nothing to do with troubled children. Once we received news of a strange occurrence: in one man's house, a big panda bear made of crystal moved from its place during the night. The owner was quite sure about it. After noticing that the bear seemed not to be in the place were it had been placed, the owner drew a circle around it with a pen. On the following day, he found that the bear had moved again a few inches out of the circle.

In one man's house, a big panda bear made of crystal moved from its place during the night.

It could not be some practical joke, because he lived alone, and we were quite sure that he was not playing a trick on us (although we never completely excluded that possibility). He had tried to determine if the movement was caused by a train passing close to his house or by the vibrations of his own stereo equipment or other household appliances. Nothing seemed to explain the phenomenon. The wardrobe on top of which the panda stood was quite steady and nailed to the wall.

Then one day, he told us that he had seen the panda move. It slid slowly and silently toward the center of the wardrobe, where the wood was slightly curved. No noises or vibrations were felt. He told us that he had tried to determine if the cause of the movement was some low-frequency vibration and had even applied Hall-effect sensors to the walls of his room. These sensors respond to an interruption of a magnetic field, such as those produced by household appliances. He suspected, in fact, that the movement was caused by an appliance in one of the neighboring apartments. He was right: the cause of the "poltergeist" was finally determined to be the new super-silent washing machine in the apartment upstairs! □

Isaac Newton, Astrologer?

Q: Are astrologers correct in saying that Isaac Newton believed in, and practiced, astrology? They like to give quotes such as Newton defending astrology to disbeliever Edmund Halley, "Sir, you have not studied astrology, I have."

—A. Lutes

A: Quotes from eminent people (like deathbed conversions) have a way of appearing more or less out of thin air. This is especially true in areas that are desperate for credibility. It's the old appeal to authority trick: Any dubious idea can be made to appear slightly less dubious if some respected scientist puts stock in it. Not just any respected scientist, mind you: they don't go for last year's Northern Wisconsin Regional Science Teacher of the Year. No, if you're going to quote, quote big. Or dead. Big and dead is best, and Newton fits the bill.

I was surprised at how many places this claim turned up. Here's a typical citation, from an astrology Web site:

> "Sir, I have studied it, you have not"—Isaac Newton, Astrologer (190 IQ) said in defense of astrology to disbeliever Halley (comet discoverer).

(How the writer knows that Newton's IQ was 190 is anyone's guess, since French psychologist Alfred Binet didn't invent the first IQ test until 1905, 178 years after Newton died. But anyway.)

As James Randi commented on this issue in his *JREF Newsletter*, "While Newton was undeniably a brilliant man, one of the most productive and perceptive of scientists who ever lived, I have no problem with the fact that in some respects, he could be simply wrong." It certainly is true that very smart people can make lapses in judgment, and even Einstein made mistakes. It is easy in retrospect to dismiss discredited beliefs, but we are all to some degree products of our age, and even brilliant men and women can get caught up in fashionable nonsense of the times. Galileo Galilei and Johannes Kepler, among others, put credence in astrology.

Sir Isaac Newton may have harbored some dubious personal beliefs, but a fervent belief in astrology was apparently not one of them. As related in Robert H. van Gent's excellent article in the June 2004 Skeptic Report, the source of this quote can be found in the book *The Life of Sir Isaac Newton* (1831). It was not *astrology* that Newton was defending from Halley's criticisms, it was *religion*. The full quote reads:

> ". . . when Dr. Halley ventured to say anything disrespectful to religion, he invariably checked him, with the remark, 'I have studied these things—you have not'."

Whether by accident or design, a misquote from Newton was conscripted into service to bolster support for astrology. The larger issue, and the implication of the quote, is that Newton took astrology seriously and conducted research into it. Despite many studies of Newton's works, no evidence of this has been found.

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Benjamin Radford is managing editor of the SKEPTICAL INQUIRER; his first book, co-authored with Bob Bartholomew, was Hoaxes, Myths, and Manias: Why We Need Critical Thinking.

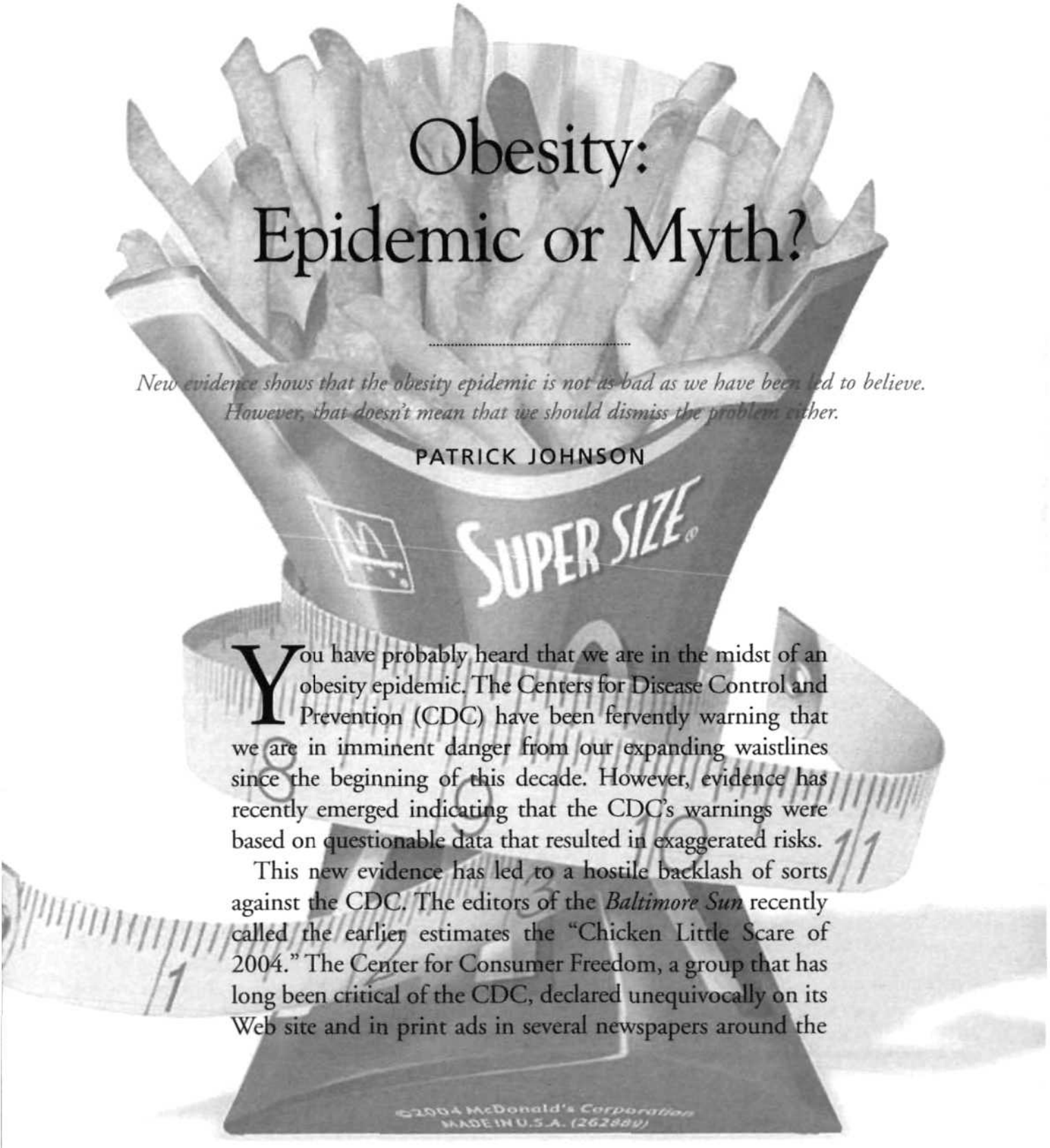
Ask the Skeptic

Wondering whatever happened to red mercury or Uri Geller? Heard about some dubious paranormal or fringe-science claim? Ask the skeptic! Submissions can be sent to: The Skeptical Inquiree, Skeptical Inquirer, P.O. Box 703, Amherst NY 14226 (or bradford@centerforinquiry.net). Not all queries can be answered, and submissions may be edited for clarity and length.

Obesity: Epidemic or Myth?

New evidence shows that the obesity epidemic is not as bad as we have been led to believe. However, that doesn't mean that we should dismiss the problem either.

PATRICK JOHNSON



You have probably heard that we are in the midst of an obesity epidemic. The Centers for Disease Control and Prevention (CDC) have been fervently warning that we are in imminent danger from our expanding waistlines since the beginning of this decade. However, evidence has recently emerged indicating that the CDC's warnings were based on questionable data that resulted in exaggerated risks.

This new evidence has led to a hostile backlash of sorts against the CDC. The editors of the *Baltimore Sun* recently called the earlier estimates the "Chicken Little Scare of 2004." The Center for Consumer Freedom, a group that has long been critical of the CDC, declared unequivocally on its Web site and in print ads in several newspapers around the

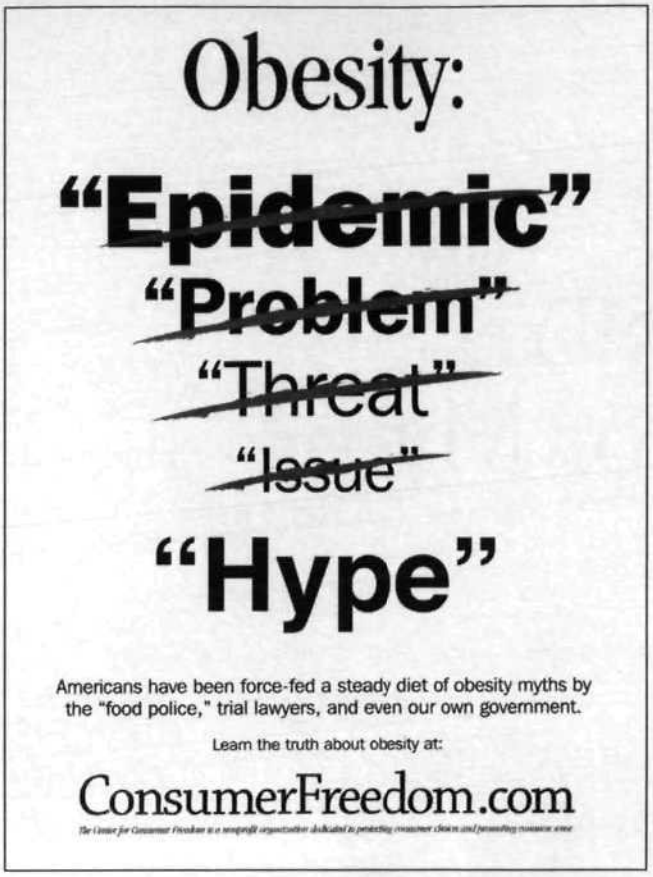


Figure 1. This advertisement, paid for by the Center for Consumer Freedom (CCF), ran in magazines and newspapers across the country. The ad was issued in response to the study in the *Journal of the American Medical Association* that found obesity-caused death rates had been exaggerated. However, CCF, an advocacy group for restaurants and food companies, has its own agenda.

country that the obesity scare was a myth (figure 1). Even Jay Leno poked fun at the CDC in one of his *Tonight Show* monologues, making the observation that "not only are we fat. . . . We can't do math either." Not everybody believes the new data, however. Cable talk show host Bill Maher commented during an episode of his show *Real Time with Bill Maher* about it being a shame that lobbyists were able to manipulate the CDC into reducing the estimated risk.

So which is it? Are we in imminent danger, or is the whole concept a myth? Looking at the scientific evidence it is clear that the extreme views on either side of the argument are incorrect. There is no doubt that many of our concerns about obesity are alarmist and exaggerated, but it is also apparent that there is a real health risk associated with it.

The Controversy

Between 1976 and 1991 the prevalence of overweight and obesity in the United States increased by about 31 percent (Heini and Weinsier 1997), then between 1994 and 2000 it increased by another 24 percent (Flegal et al. 2002). This trend, according to a 2004 analysis, shows little sign of slowing down (Hedley et al. 2004). The fact that more of us are getting fatter all the time raises a significant public health concern. The Centers for Disease Control and Prevention (CDC) began calling the problem an epidemic in the beginning of this decade as the result of research that estimated 280,000 annual deaths as a consequence of obesity (Allison et al. 1999). Since then there has been a strong media campaign devoted to convincing Americans to lose weight. In 2003, Dr. Julie Gerberding, the director of the CDC, made a speech claiming that the health impact of obesity would be worse than the influenza epidemic of the early twentieth century or the black plague of the Middle Ages. In 2004 the campaign reached a fever pitch when a report was released that increased the estimate of obesity-related deaths to 400,000 (Mokdad et al. 2004). Finally, in March of this year, a report appeared in the *New England Journal of Medicine* that predicted a decline in life expectancy in the United States as a direct result of obesity (Olshansky, et al. 2005).

Despite the assertions that obesity is causing our society great harm, however, many scientists and activist groups have disputed the level of danger that it actually poses. Indeed, a recent analysis presented in the *Journal of the American Medical Association* (*JAMA*) by Katherine Flegal of the CDC and her colleagues calls the severity of the dangers of excess body fat into question, indicating that the number of overweight and obesity-related deaths is actually about 26,000—about one fifteenth the earlier estimate of 400,000 (Flegal et al. 2005).

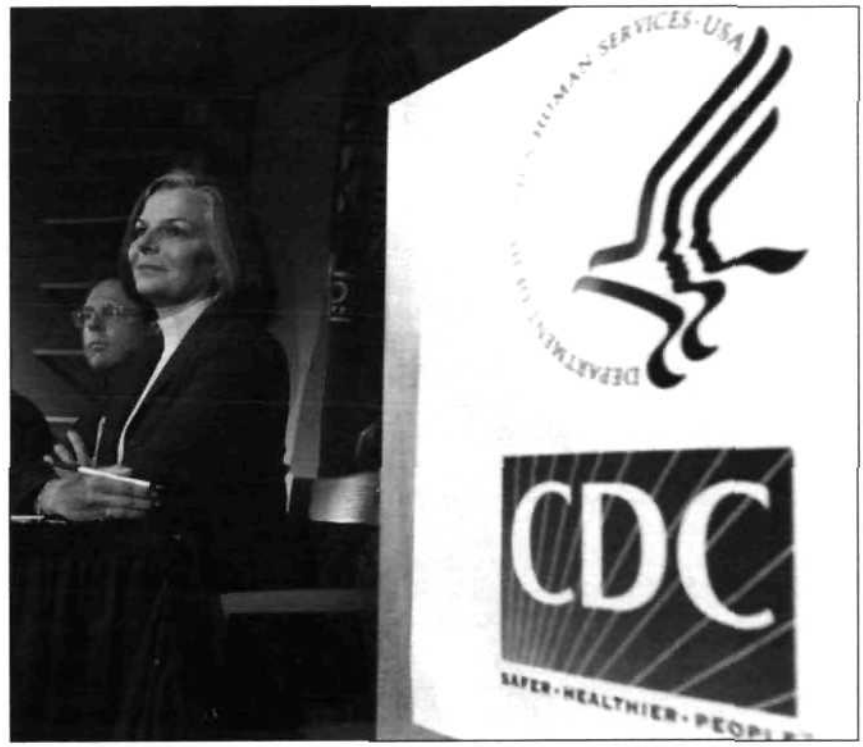
There is little argument about the fact that, as a nation, more of us are fatter than ever before; the disagreement lies in the effect that this has on our health. The campaign to convince us to lose weight gained much of its momentum in 2004; not only were there high-profile public health initiatives devoted to stopping the obesity epidemic, but the idea had pervaded popular culture as well. Movies like Morgan Spurlock's *Super Size Me* were the topic of many a discussion, and there were regular news reports about the dangers of too much fat.

During this campaign, however, there were some notable dissenters. Paul Ernsberger, a professor of nutrition at Case Western Reserve University, has been doing research since the 1980s that led him to assert that obesity is not the cause of ill health but rather the effect of sedentary living and poor nutrition, which are the actual causes. Another prominent researcher, Steven Blair, director of the Cooper Institute of Aerobics Research in Dallas, Texas, has been an author on several studies indicating that the risks associated with obesity can be significantly reduced if one engages in regular physical activity, even if weight loss is not present. According to Blair, weight loss should not be ignored but a greater focus should be placed on physical activity and good nutrition. Both Ernsberger and Blair indicated to me that they thought the new research by Flegal and her colleagues provides a more accurate picture of the mortality risk associated with obesity.

While scientists like Ernsberger and Blair have been presenting their conclusions in the scientific forum, others have

Patrick Johnson is a biology instructor at Washtenaw Community College in southeast Michigan and a clinical exercise physiologist who writes frequently about health, nutrition, and fitness claims. He lives with his wife and his eight-year-old son. E-mail: johnsonp@wccnet.edu.

taken a more inflammatory approach. In his 2004 book, *The Obesity Myth*, Paul Campos argues that the public health problem we have associated with obesity is a myth and further claims that our loathing of fat has damaged our culture (see Benjamin Radford's review on page 50). The most antagonistic group, however, is the Center for Consumer Freedom (CCF) (www.consumerfreedom.com), which implies that the obesity epidemic is a conspiracy between the pharmaceutical industries and the public health establishment to create a better market for weight-loss drugs. Numerous articles on the organization's Web site bash several of the most prominent obesity researchers who have disclosed financial ties to the pharmaceutical industries. Paul Ernsberger echoed this sentiment. He told me that the inflated mortality statistics were all based on the work of David Allison, a well-known pharmacoeconomics expert. "These experts create cost-benefit analyses which are part of all drug applications to the FDA. These self-serving analyses start by exaggerating as much as possible the cost to society of the ailment to be treated (obesity in the case of weight-loss drugs). The risks associated with the new drug are severely underestimated, which results in an extremely favorable risk-benefit analysis, which is almost never realized once the drug is on the market. Experts who can produce highly favorable risk-benefit analyses are very much in demand, however."



CDC Director Dr. Julie Gerberding answers questions at a press conference. (Photo credit: REUTERS/Tami Chappell)

The claims made by the CCF are given some credence by Ernsberger's corroboration; however, there is a noteworthy problem with their own objectivity. On their Web site they present themselves as a consumer-minded libertarian group that exists to "promote personal responsibility and protect consumer choices." Upon closer examination, however, it becomes evident that the CCF is an advocacy group for restaurants and food companies, who have as much to gain by the threat of obesity being a myth as the pharmaceutical industry does by the danger being dire.

It is clear that there are agenda-determined interests on both sides of the issue. Therefore, the best way to discern what is necessary for good health is to shift our focus away from the sensational parts of the controversy and look at the science itself.

Current Science and Obesity Risks

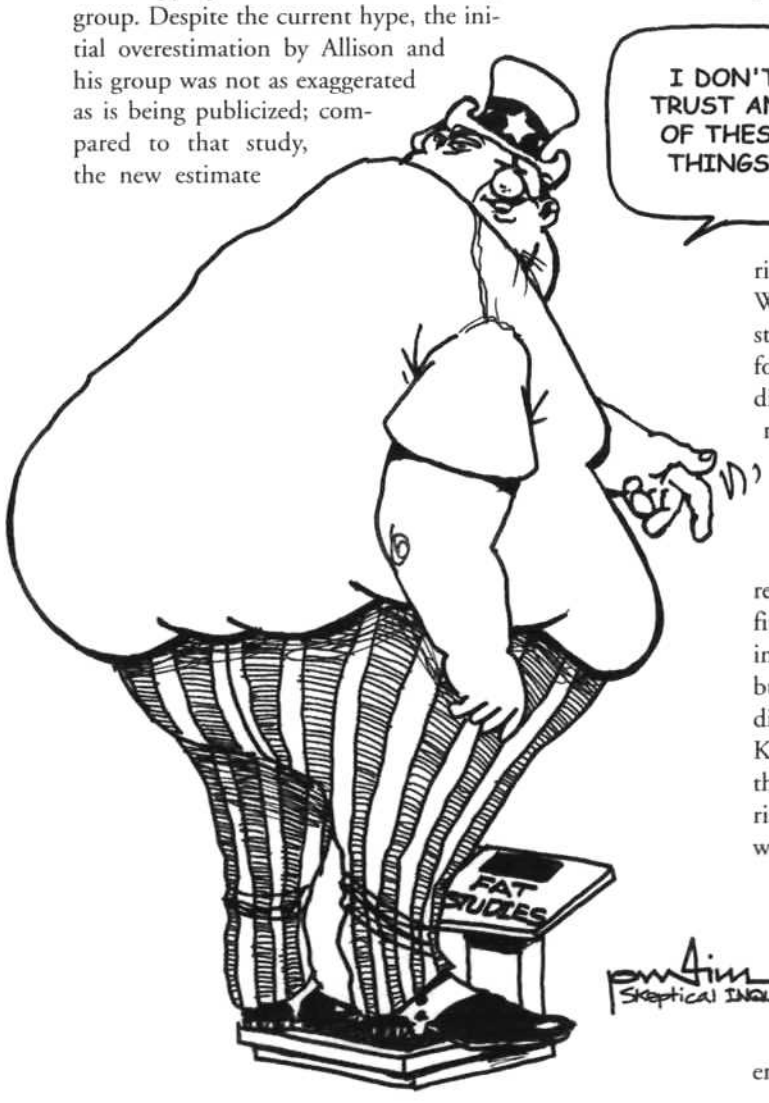
In their recent article, Katherine Flegal and her colleagues (2005) point out that the earlier mortality estimates were based on analyses that were methodologically flawed because in their calculations the authors used *adjusted* relative risks in an equation that was developed for *unadjusted* relative risk. This, according to Flegal's group, meant that the old estimates only partially accounted for confounding factors. The older estimates, furthermore "did not account for variation by age in the relation of body weight to mortality, and did not include measures of uncertainty in the form of [standard errors] or confidence intervals." These authors also point out that the previous estimates relied on studies that had notable limitations: "Four of six included only older data (two studies ended follow-up in the 1970s and two in the 1980s), three had only self-reported weight and height, three had data only from small geographic areas, and one study included only women. Only one data set, the National Health and Nutrition Examination Survey I, was nationally representative" (Flegal et al. 2005). In their current investigation, Flegal's group addressed this problem by using data only from nationally representative samples with measured heights and weights. Further, they accounted for confounding variables and included standard errors for the estimates.

Obesity was determined in this analysis using each subject's body mass index, which is a simple height-to-weight ratio. A BMI of 18 to 24 is considered to be the normal weight, 25–29 is considered overweight, and 30 and above is considered obese. The data from this study indicated that people who were underweight experienced 33,746 more deaths than normal-weight people, and that people who were overweight or obese experienced 25,814 more deaths than the normal-weight folks. This estimate is being reported in the popular media as being one-fifteenth the earlier estimate of 400,000. However, conflating the categories of overweight and obesity this way is misleading.

At first glance, it appears that underweight poses a bigger threat to our health than overweight and obesity, and that the earlier estimates were profoundly exaggerated. However, in this study the people who fit into the *obese* category actually

experienced 111,909 excess deaths compared to normal-weight subjects. In contrast, those who were categorized as *overweight* experienced 86,094 fewer deaths than those who were normal weight. The figure of 25,815 is the difference between the obesity deaths and the overweight survivals. In the original study by David Allison and his colleagues (Allison et al. 1999) it is actually estimated that 280,000 deaths result from overweight and obesity and that 80 percent, or 224,000, of these deaths occurred in people who were in the obese category. However, the study by Mokdad and colleagues (2004), using the same methods developed by Allison et al., estimated 400,000 obesity-related deaths, and subsequently fueled much of the recent fervor surrounding the obesity epidemic. In this study, no distinction was made between overweight and obesity and the authors failed to distinguish between obesity, physical inactivity, and poor diet. All of these variables were simply lumped together.

A few things become clearer after examining the data. First, it appears that our categories are mislabeled; being classified as overweight appears to give one an advantage (statistically, anyway) over those who are in the ideal weight range.[1] Moreover, it is inappropriate to consider overweight and obese as one group. Despite the current hype, the initial overestimation by Allison and his group was not as exaggerated as is being publicized; compared to that study, the new estimate is actually about half of the old number. Finally, it is apparent that many at the CDC were simply confirming their own biases when they accepted the estimate by Mokdad et al. The categories in that study—that was, intriguingly, co-authored by CDC director Julie Gerberding, which may provide some insight into why it was so readily accepted—were far too broad to provide useful information. The fact that this flaw was ignored shows how easy it is to accept evidence that supports our preconceived notions or our political agendas.



There is another problem inherent in all of the above mortality estimates. They are based on epidemiological data that show correlation but leave us guessing as to causation. Various factors are interrelated with increased mortality—obesity, inactivity, poor nutrition, smoking, etc. Yet, without carefully controlled experiments, it is hard to determine which factors cause—and which are symptoms of—poor health. This is a difficult limitation to overcome, however, because we can't recruit subjects and have them get fat to see if they get sick and/or die sooner. Most institutional review boards would not approve that sort of research, and furthermore I can't imagine that there would be a large pool of subjects willing to participate. There are, however, observational data that were collected with fitness in mind, which help to clarify the picture somewhat.

In 1970 researchers at the Cooper Institute for Aerobics Research in Dallas, Texas, began to gather data for a longitudinal study that was called, pragmatically enough, the Aerobics Center Longitudinal Study (ACLS). This study looked at a variety of different variables to estimate the health risks and benefits of certain behaviors and lifestyle choices. What set this study apart from other large-scale observational studies, however, was that instead of relying on self-reporting for variables like exercise habits, they tested fitness levels directly by way of a graded exercise test (GXT). A GXT requires a person to walk on a treadmill as long as he or she can with increases in speed and incline at regular intervals. This is the most reliable way we know of to assess a person's physical fitness.

With an accurate measure of the subjects' fitness levels, researchers at the Cooper Institute have been able to include fitness as a covariate with obesity. Analysis of the data obtained in the ACLS shows that there is a risk associated with obesity, but when you control for physical activity, much of that risk disappears (Church et al. 2004; Katzmarzyk et al. 2004; Katzmarzyk et al. 2004; Lee et al. 1999). One study showed that obese men who performed regular exercise had a lower risk of developing cardiovascular disease than lean men who were out of shape (Lee et al. 1999).

Steven Blair, who runs the Cooper Institute and was an author on all four of the above-mentioned studies, however, does not think obesity should be ignored. "I do think obesity is a public health problem, although I also think that the primary cause of the obesity epidemic is a declining level of average daily energy expenditure . . . it will be unfortunate if it is now

assumed that we should ignore obesity. I do not think that the [health] risk of obesity is a myth, although it has been overestimated." Blair believes that a focus on good nutrition and increased physical activity rather than on weight loss will better serve us.

In spite of the fact that there are virtually no controlled clinical trials examining the effects of obesity in people, we can make some inferences from animal research. Investigations performed by Ernsberger and his colleagues have shown that, over time, weight cycling (temporary weight loss followed by a regain of that weight, otherwise known as yo-yoing) in obese laboratory animals increases blood pressure, enlarges the heart, damages the kidney, increases abdominal fat deposits, and promotes further weight gain (Ernsberger and Koletsky 1993; Ernsberger et al. 1996; Ernsberger and Koletsky 1999). This indicates that the yo-yo effect of crash dieting may be the cause of many of the problems we attribute to simply being fat.

Even though there is a health risk from being too fat, you can eliminate much of the potential risk by exercising. Moreover, it is probably a bad idea to jump from diet to diet given the negative consequences the yo-yo effect can have. According to another study published in *JAMA*, the risk of cardiovascular disease has declined across all BMI groups over the past forty years as the result of better drugs (Gregg et al. 2005).

None of this means, however, that we should simply abandon our attempts to maintain a healthy weight; obese people had twice the incidence of hypertension compared to lean people and, most significantly, there has been (according to the above study) a 55 percent increase in diabetes[2] that corresponds to the increase in obesity. So while we are better at dealing with the problem once it occurs, it is still better to avoid developing the problem in the first place.

Condemning the CDC

Whatever side of the argument you are on, it is apparent that many in the CDC acted irresponsibly. However, despite the fact that the initial, exaggerated estimate came from people at the CDC, we should keep in mind that *so did the corrected number.* While this can be frustrating to the casual observer, it is also a testament to the corrective power of the scientific method.

Science is about provisional truths that can be changed when evidence indicates that they should be. The fact that scientific information is available to the public is its greatest strength. Most of us, for whatever reason—whether it's self-interest or self-delusion—don't view our own ideas as critically as we should. The fact that scientific ideas are available for all to see allows those who disagree to disprove them. This is what has happened at the CDC; the most current study has addressed the flaws of the earlier studies. It is true that many of those in power at the CDC uncritically embraced the earlier estimates and overreacted, or worse simply accepted research that was flawed because it bolstered their agendas. But that failure lies with the people involved, not with the CDC as an institution or with the science itself.

The evidence still shows that morbid obesity is associated with an increased likelihood of developing disease and suffering from early mortality, but it also shows that those who are a few pounds overweight don't need to panic. What's more, it is clear that everyone, fat or thin, will benefit from regular exercise regardless of whether they lose weight.

The lesson to be learned from this controversy is that rational moderation is in order. Disproving one extreme idea does not prove the opposite extreme. As Steven Blair told me, "It is time to focus our attention on the key behaviors of eating a healthful diet (plenty of fruits and veggies, a lot of whole grains, and not too much fat and alcohol) and being physically active every day."

Notes

1. This is not the first time this has been shown. The following studies are also large-scale epidemiological studies that have found the overweight category is where the longest lifespan occurs: Waaler H.T. 1984. Height and weight and mortality: The Norwegian experience. *Acta Medica Scandinavica Supplementum* 679, 1–56; and Hirdes, J., Forbes, W. 1992. The importance of social relationships, socioeconomic status and health practices with respect to mortality in healthy Ontario males. *Journal of Clinical Epidemiology* 45:175–182.

2. This is for both diagnosed and undiagnosed individuals.

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The Elixir of Life

Green Tea or Red Wine?

Green tea, steeped in an ancient civilization, conquered the West because of its supposed health effects. Wine, particularly red wine, is a relative newcomer to the health scene. Tea leaves and red grapes are said to line the path to a long and healthy life. The evidence, however, is not convincing.

WILLIAM H. BAARSCHERS

Hot infusions of the leaves of *Camillia sinensis* have been used in China for "thousands of years," supposedly discovered by emperor Shen-Nung in 2737 B.C. He accidentally dropped a few leaves into boiling water, and the warm drink made him feel better. Tea drinkers outside Asia prefer black tea, made by roasting and fermenting the leaves. Tea contains caffeine, which stimulates the central nervous system. It is also a diuretic and a respiratory stimulant. That a warm cup of tea can "perk you up" has a firm physiological basis. This is also true for other caffeine-containing stimulants, like coffee or cocoa, but tea boasts that romantic history of an ancient emperor fumbling with tea leaves and hot water.

Initially, green tea became important in human health because of the stimulating effect of caffeine; the emperor did not know about antioxidants. Today, antioxidants in tea, particularly green tea, are said to protect us from cancer. Why? Notwithstanding high rates of cigarette smoking, the tea-drinking Chinese have one of the lowest lung cancer rates in the world.

But what about the other killer, heart disease? Green tea research makes no mention of our hearts at all. Well, it appears we just have to drink more. Red wine this time, another beverage rich in antioxidants. That is because of the French. They eat a rich diet with butter and creamy cheeses like Camembert and Brie, and according to a French diet writer, few or no vegetables (Montignac 1998). Yet the French enjoy the lowest rate of heart disease among Western countries. Apparently, this so-called French Paradox is explained by the French custom of drinking wine with their meals (Renaud and de Lorgeril 1992).

The wine antioxidants occur mostly in grape skin, so only red wine, which is fermented "on the skin," will do. However, the antioxidants in green tea are close chemical relatives of the antioxidants in red wine. So the real paradox is this: antioxidants in green tea specifically protect the Chinese from lung cancer while other, *very closely related* antioxidants in red wine specifically protect the French heart. Obviously we must drink both green tea and red wine. And, according to other nutrition authorities, we already need three glasses of milk and six glasses of water a day. This could give a whole new meaning to "being on a liquid diet." The question is, how solid is the evidence?

Antioxidants

There is no question about the antioxidant properties of some green tea constituents like *epigallocatechol gallate* (EGCG). Like many other plant extracts, green tea inhibits growth of cancer cells in the lab and in some rodents, but studies on humans are quite inconclusive. In fact, a meta-analysis of some thirty studies mentions several reports that link green tea consumption with an *increased* incidence of some cancers (Bushman 1998).

On the other hand, the French Paradox has become a popular overlay on the picture of the much-studied Mediterranean diet, which is rich in antioxidant-containing vegetables, like cabbage and tomatoes, unsaturated fats like olive oil, and wine (Matalas et al. 2001). This diet is said to decrease the incidence of heart disease and promote longevity. The French Paradox made the benefits of red wine into nutritional doctrine. Resveratrol, the main antioxidant in red wine, may even protect against cancer (Jang et al. 1997), although it can also promote atherosclerosis (Wilson et al.1996).

As is the case with the green tea literature, there is also disagreement on the wine story. Some reports mention increased antioxidant activity in blood serum after red wine consumption (Maxwell et al. 1994), while others suggest it is just the alcohol, independent of the type of beverage, that does the trick (Klatsky et al. 1997). So, the paradox remains. Surely if antioxidants protect the Chinese from lung cancer and the French from heart attacks, we would also expect the Chinese to have fewer heart attacks, and the French to have low lung cancer rates. And shouldn't both the Chinese and the French live longer than the rest of us?

Like many other plant extracts, green tea inhibits growth of cancer cells in the lab and in some rodents, but studies on humans are quite inconclusive.

Reading the Numbers in the Tea Leaves

Experts in tea, wine, and the Mediterranean diet often mention higher life expectancies and frequently make claims of exceptional longevities. These numbers can be measured and are available in several places. The United Nations publishes a vast amount of information on many aspects of human life. The forty-eighth issue of the *United Nations Demographic Yearbook* (1996) concentrated on mortality statistics.

Unfortunately, the life expectancy statistics are not very helpful. The *Yearbook*'s table 4 gives us male and female life expectancy at birth. When we follow the example of some actuaries and average the male and female numbers to get a less complex picture of unisex data, we see that Mediterranean Greece and France don't particularly stand out from other industrialized countries. The tea-drinking Japanese are indeed at the top but the tea-drinking Chinese rank last.

Japan	79.61	France	76.85
Sweden	78.75	U.K.	76.71
Canada	77.75	U.S.A.	75.70
Greece	77.60	China	68.67

Table 1. Unisex life expectancy at birth.

Of course, life expectancy at birth is readily confounded by infant mortality. However, if green tea and red wine are healthy, drinkers should live longer than non-drinkers. The *Yearbook*'s table 7 contains the numbers of total populations and of the over-65 cohorts, by country. Converting these large,

William H. Baarschers is a professor emeritus of chemistry at Lakehead University in Thunder Bay, Ontario. His research interests have included the chemistry of medicinal plants, synthetic chemistry, environmental science, and industrial toxicology. He is currently an advisor to the university's Resource Centre for Occupational Health and Safety. He is the author of Eco-Facts and Eco-Fiction: Understanding the Environmental Debate *(Routledge, 1996).*

unwieldy numbers into percentages allows for a quick comparison of a few selected countries' cohorts older than age 65 (table 2, 1990s data). Although population fractions of older people can be confounded by birth rates, table 2 does show a trend, and it doesn't point the same way as the data on life expectancy.

Japan and France, with high life expectancies, rank below average in the over-65 age group, and Mediterranean Greece ranks below non-Mediterranean Sweden. In Canada and the U.S. the over-65 cohort is much lower. Maybe we eat too much, or perhaps we drive too fast. The Chinese are again at the bottom.

Since we are dealing, presumably, with long-term life styles, it matters little that the *Yearbook*'s data are from the early 1990s. We find 2003 updates of these figures at the Population Reference Bureau (www.prb.org). And behold, despite worldwide pollution and poor eating habits, in little more than a decade nearly all life expectancies increased by a few years, and the over 65 cohort has grown in all countries. An anomaly in the more recent figures is a jump in the over-65 group in Japan and in Greece to 19 percent of their populations, which bumps Sweden from its top ranking. Whether these are true, one-decade improvements, or just anomalies in data collecting or reporting is unclear.

Country	1990s data	2003 estimates
Sweden	17.0	17.5
Greece	16.0	19.0
U.K.	16.0	16.1
Japan	15.5	19.0
France	14.5	16.0
U.S.A.	12.8	13.0
Canada	12.2	13.0
China	5.6	7.0

Table 2. The over-65 cohort as a percentage of total population.

Whatever the benefits of red wine and green tea, so far we see no convincing numbers that a longer life is one of them. However, there are further useful numbers. The *Yearbook* also shows rates of death by cause in its table 29. China is missing from this table, but there is another source of information for that country. Of course, *rate of death* due to a given disease is not the same as the *incidence*, the actual frequency of occurrence, of that disease. Relevant to the green tea issue, the mortality rate due to lung cancer in Japan, at 34.8 per 100,000, is higher than in Israel and Sweden, and marginally lower than in Finland and Norway.

A two-part report sheds light on the Chinese lung cancer issue. In industrialized countries, cigarette smoking in males increased strongly during the early twentieth century, stabilizing by the 1950s. Deaths directly attributable to tobacco began to rise well after mid-century, and reached a plateau in the 1990s. Thus, a delay of several decades separates an increase in smoking from the increase in smoking-related deaths. Early low smoking rates among Chinese males started to increase well after 1952, and only reached today's high level by 1996. Applying a similar delay, smoking-related deaths in China will reach significantly higher levels only around 2030. Chinese male mortality directly attributable to smoking, about 12 percent in 1990, is expected to rise to 33 percent by 2030 (Liu et al. 1998). Clearly, the idea that China and Japan have the lowest lung cancer rates in the industrial world because of their tea drinking habits is at odds with these readily available health statistics.

In the *Yearbook*'s table 29 on mortality rates, causes of death are identified by several dozen internationally agreed-upon codes, like AM29 for "acute myocardial infarction," and AM30 for "other ischemic heart diseases." An analysis of these numbers shows that, indeed, mortality rates due to heart disease in France and Spain are the lowest in the Western world, and lower still in Japan. Greece ranks above non-Mediterranean Belgium, but well below the Northern European countries. The Mediterranean and Japanese hearts seem okay, but their arteries are not. That same table 29 in the *Yearbook* shows that both France and Greece rank among the highest in mortality rates due to circulatory disease.

And in the end, a comparison of all-cause mortality rates makes much of the red wine hype disappear among the many other, different causes from which people die. Curiously, France also has the third highest mortality rate due to liver disease, after Germany and Spain. Alcohol is a liver poison, and more than three drinks daily significantly increases cancer risks. Perhaps alcohol with every meal, be it French wine or German beer, is not such a good idea after all.

Other Explanations

Some data seem to support claims that the Japanese have the highest average life span among industrialized countries, although these claims seem to be based on a comparison of life expectancies (Kobayashi 1992). Also, the Mediterranean countries do have lower total mortality rates than the Scandinavians, though these rates are lower still in Japan, Canada, and Australia. However, there are several other interesting observations that offer more plausible explanations than the tea and wine stories.

British researchers proposed a simple explanation for the French Paradox. Consumption of animal fat, a major dietary cause of heart disease, increased substantially in France between 1965 and 1988. Their study also shows a considerable time lag between long-term fat consumption and the onset of atherosclerosis. They explain the current low rate of heart disease in France by a simple time-lag phenomenon, and predict that this rate will rise in the coming decade (Law and Wald 1999). A similar increase in the consumption of animal fat took place in several other Mediterranean countries (Serra-Majem et al. 1995, Matalas et al. 2001). The story is not unlike that of the cigarette smoking Chinese. Clearly, the Mediterranean diet is changing. Again, proof is still some years away.

Spanish researchers also studied diet and heart disease in their country. They came up, surprise, with the Spanish Paradox (Serra-Majem et al. 1995). That report did not generate the same fuss as the French Paradox, maybe because the

Spaniards lacked the glamour of the red wine. Their "paradoxical" results do show a decrease in heart disease mortality from the mid 1970s onward. However, during the two relevant decades, the Spanish dramatically increased their consumption of meat, fat, and dairy products. They also decreased their consumption of super-healthy olive oil and replaced it with cheaper seed oils. Also, the Spanish researchers could not use red wine to explain their paradox, because between 1975 and 1995 Spanish wine consumption decreased by nearly 50 percent. These observations contrast markedly with current popular view of the Mediterranean diet. Not surprisingly, that report concludes with the suggestion that diet, although important, is probably not as important as other factors operating in Spain, and elsewhere, such as improved medical resources, an aggressive antismoking campaign, and the increased use of aspirin as a preventive blood thinner.

Then there is the story about a gene on human chromosome 19, which codes for a protein called *apolipoprotein E.* When this apolipoprotein binds with cholesterol and fatty acids, it forms the high and low density lipoproteins (HDL and LDL) that control the transport of fats in our blood. Inherited variations in this gene lead to different forms of apolipoprotein E. A variant called E3 is better at handling fat transport than another variant called E4. If your parents gave you the E3 variant, you can handle dietary fat better, and your risk of cardiovascular disease is lower, than if you were born with the gene for E4. Very few diet writers mention this important influence of genetics (Matalas et al. 2001).

The gradient of the frequency distribution of these genetic variants across Europe almost look like the isobars on a weather map, with E3 more prevalent in southern Europe, around the Mediterranean, and E4 much more common in the North (Lucotte et al. 1997). When it comes to cardiovascular disease and fat metabolism, South Europeans have a genetic advantage. Yes, heart disease is less common in the Mediterranean area. Whether it is their diet or their genes, we don't know. Perhaps the Mediterraneans are just a few decades behind with destroying their healthy eating habits.

A similar effect, hidden in the genetic past of human evolution, may explain Japanese longevity. In a Japanese study we find that a mutation in mitochondrial DNA, which may be linked to longevity, is relatively rare in the global population, but occurs in almost half the population of Japan. Japanese longevity, if it is real, may have more to do with a genetic quirk than with diet (Tanaka et al. 1998).

So, while green tea is still hidden in the fog of uncertainty, it may be a good idea to hang on to Happy Hour. There are definite indications that a few drinks a day of *any* alcoholic beverage can reduce the risk of heart disease, although evidence that red wine is best remains elusive (German and Walzem 2000). And the Mediterranean diet, stripped of the hoopla of the French Paradox, does have distinct health benefits, both in terms of survival after cancer (De Lorgeril et al. 1998), and after a first heart attack (Matalas et al. 2001).

Clearly, there is little evidence for labeling green tea as an anti-cancer beverage. And what happens to our hearts may have more to do with our genes than with red wine. Still, maintaining good drinking habits seems a good idea.

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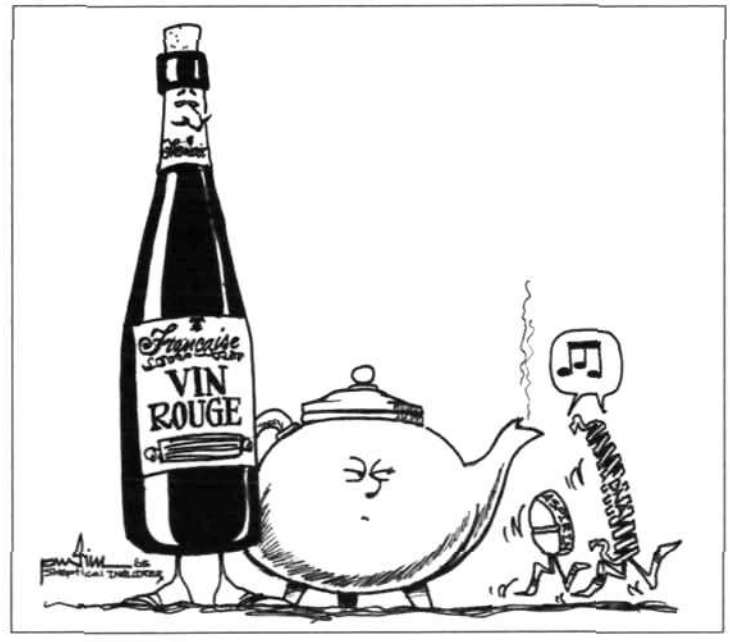
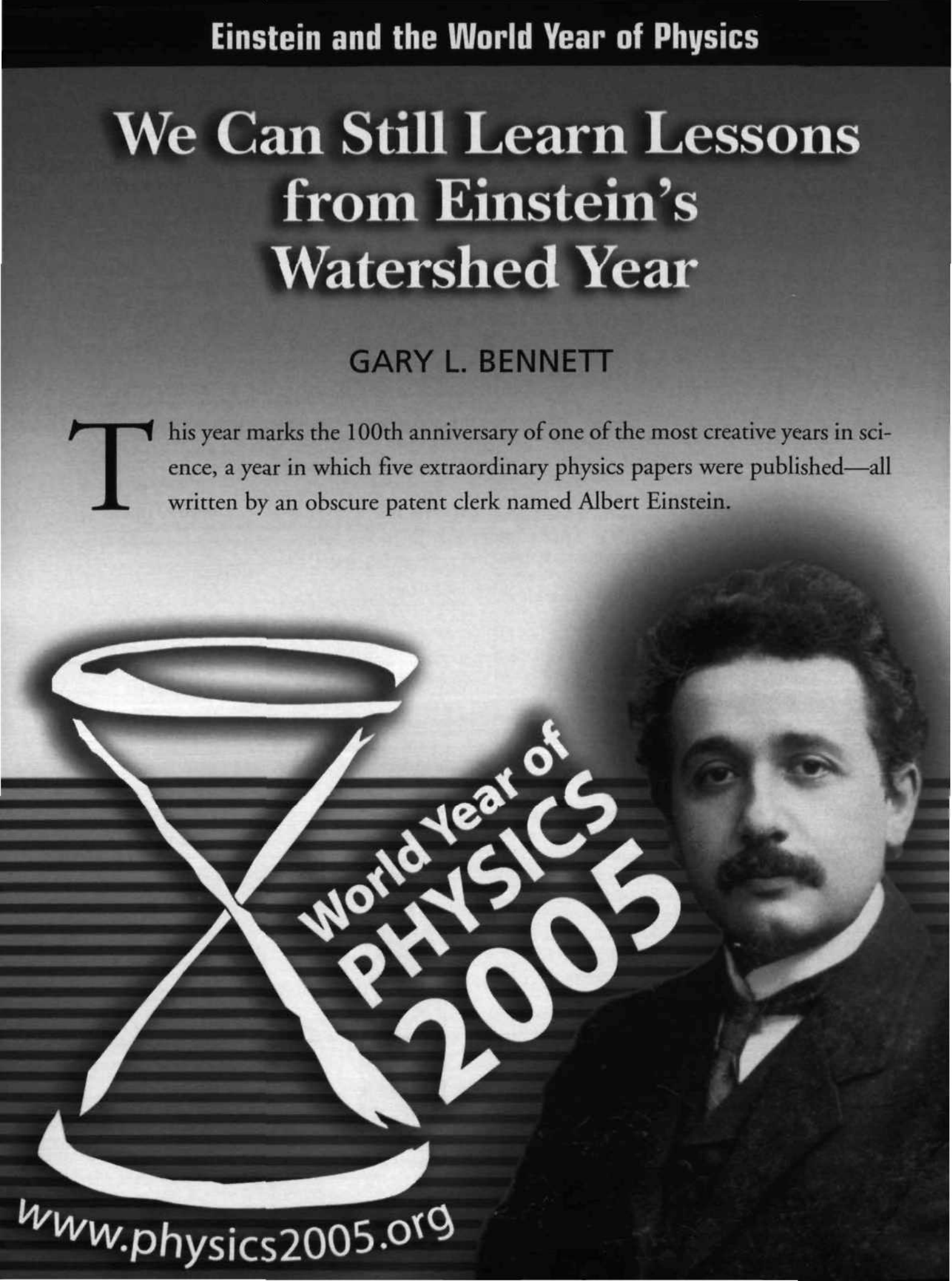


We Can Still Learn Lessons from Einstein's Watershed Year

GARY L. BENNETT

This year marks the 100th anniversary of one of the most creative years in science, a year in which five extraordinary physics papers were published—all written by an obscure patent clerk named Albert Einstein.



To honor Einstein's discoveries, 2005 has been declared the World Year of Physics. Visit www.physics2005.org to find out how you can get involved.

Einstein's first paper (March 1905) addressed a question that had puzzled physicists since the late nineteenth century: Why did a light beam incident on a metallic surface cause electrons (tiny negative particles) to be released? The solution that Einstein developed completely transformed physics and paved the theoretical way for the laser, computer chips, and solar cells among numerous other inventions. What Einstein did was assume that light behaved like particles instead of the waves previously envisioned. For this Einstein received the Nobel Prize in 1921.

With that conceptual breakthrough other physicists soon developed the quantum theory, one of the two great revolutions in twentieth century physics.

Quantum theory envisions a universe that has a certain graininess and that is intrinsically stochastic at the submicroscopic level. For example, distances and energies come in discrete packets instead of being continuous phenomena as envisioned by classical physics.

Einstein's second paper, released in April 1905, was his doctoral dissertation. In it he developed a formula for measuring the size of molecules.

In his third paper, in May 1905, Einstein dealt with the jerky motion ("Brownian motion") of particles suspended in liquids. This, he said, was caused by collisions between the particles and the atoms and molecules that comprise the liquid. Today we are so used to hearing terms like *atoms* and *molecules* that we tend to forget that once there was a great debate in science as to whether or not such entities really existed. Einstein helped settle that question.

Einstein's fourth paper, in June 1905, is the one most people would probably cite as his major contribution to physics. In this paper Einstein developed what is now termed the special theory of relativity. In short, what we observe depends upon our reference frame (how we are moving relative to what we are observing). Ten years later, in the midst of World War I, Einstein generalized his theory of relativity thereby explaining gravity and giving us the tools to understand cosmology, including black holes and the expansion of the Universe. Relativity theory was the second great revolution in twentieth-century physics.

In September 1905, in his fifth paper, Einstein showed the equivalence of matter and energy in the famous equation $E=mc^2$ (energy equals mass times the speed of light squared). This is the equation which explains the explosive potential of nuclear weapons and how stars produce energy.

Einstein was one of many scientists who fled their home countries in the 1930s with the rise of fascism. In a sense Hitler's murderous regime moved the seat of twentieth-century science from Europe to the U.S. This fact should be pondered by those who want to close America's borders to foreign immigration at a time when American students have turned away from science and engineering.

Einstein devoted considerable time to working for peace and raising money for refugees. The International Rescue Committee, which he founded, is at the forefront in helping disaster and war refugees around the world.

Today, when science—from stem cells to quantum theory—is under assault by right-wing religious zealots and left-wing postmodernists, we should all pause to remember and honor Einstein's observation that science "is the most precious thing we have."

Gary L. Bennett is an aerospace consultant who holds a Ph.D. in physics. He is author of The Star Sailors, *a novel about reason (soon to be reissued).*

The Twin Paradox

DAVE THOMAS

The "twin paradox" is not a paradox in the sense of a logical contradiction that falsifies relativity but rather a very curious puzzle. Traditionally, the twin paradox is concerned with the strange result that if one of two twin brothers leaves the other and embarks on a high-speed journey to a remote point and back again, the twins will no longer be the same age. Let's call these hypothetical twin brothers A and B. For this discussion, we'll stipulate that A stays home while B travels away from his brother at a speed of 60 percent of the speed of light (0.6c, where c is the speed of light, nearly 300 million meters per second). B travels for fifteen years by A's reckoning then quickly decelerates to a stop, turns around, and quickly accelerates back *to 0.6c in the direction toward his brother, A.* After another fifteen years (again, by A's reckoning), B arrives home, decelerates, and rejoins his brother, who has aged thirty years since he last saw B. The "paradox" is that, even though A's velocity relative to B is *the same* as B's velocity relative to A, B will have experienced only twenty-four years of travel and find himself *six years younger than his twin brother, A.*

While this is indeed puzzling, it is not a logical flaw in relativity. The twins do not have similar experiences during B's long journey, and that resolves the "paradox." (While the fiction of very short deceleration/acceleration periods is useful to keep this discussion from getting into general relativity theory, it should be noted that such accelerations would almost certainly reduce twin B to a thin red puddle. It would take *weeks* to make the *velocity changes at tolerable accelerations, say 5 to* 10 g. See my accompanying sidebar "On Problems with Near-light-speed Travel" for more on this type of difficulty.) The journey of B, as viewed by twin A, is depicted in figure 1.

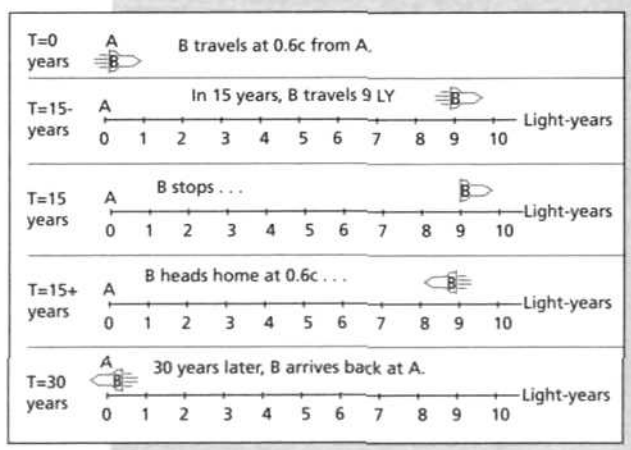

T=0 years
A
B
B travels at 0.6c from A.
T=15- years
In 15 years, B travels 9 LY
Light-years
0 1 2 3 4 5 6 7 8 9 10
T=15 years
B stops . . .
T=15+ years
B heads home at 0.6c . . .
T=30 years
30 years later, B arrives back at A.

Figure 1: The journey of twin B, as observed by twin A.

Special Relativity after 100 Years

Special relativity has been phenomenally successful, but its nonintuitive nature has made it difficult for us to absorb Einstein's central message about time and simultaneity.

JOHN GEOHEGAN

One hundred years after Albert Einstein gave us the theory of special relativity, we have made good progress in applying the equations he gave us, but we have difficulty absorbing his central message about time and simultaneity. Time and again, his predictions have been tested; the Global Positioning System simply wouldn't give us good results unless Einstein's equations were hidden in the little handheld GPS instruments used by hunters and hikers to find their way in the woods. Special relativity has been combined with quantum physics to produce quantum electrodynamics, the most accurate physical theory ever devised. Shortly after Einstein finished his famous paper, he used it to derive the famous equation $E=mc^2$, showing that

when a body radiates energy, it loses mass.

So what's the problem? Well, we haven't yet absorbed his message that "we cannot ascribe *absolute* meaning to the concept of simultaneity; instead, two events that are simultaneous when observed from some particular coordinate system can no longer be considered simultaneous when observed from a system that is moving relative to that system" (Einstein 1905, 130). As long as we think there's such a thing as "a point in time" or events that can be described as universally simultaneous, we will be faced with misconceptions such as "moving clocks run slow" and "moving objects shrink in the direction of motion." The following simple thought experiment shows how such misconceptions can arise.

Imagine two identical space ships, A and B, far out in space, away from any large gravitating bodies, traveling away from each other at a high velocity. Neither one is accelerating, no engines are operating, and the occupants of each ship consider their ship to be motionless while the other ship is moving rapidly away. The two ships have just passed each other, almost colliding, and at their closest positions, they have synchronized their identical clocks at 12:00. The clocks each cause a bright blue light on the outer hull of their respective ships to flash each hour, and the ships are separating so rapidly that the passengers on each see the blue light of the other shifted to half its frequency, into the infrared. This is the famous red shift caused by the Doppler effect, in this case a shift of 100 percent. The same shift means that the light signals sent out by A at 1:00, 2:00, and 3:00 according to A's clock will be received by B at 2:00, 4:00, and 6:00 according to B's clock. Similarly, A will receive signals from B at 2:00, 4:00, and 6:00 according to A's clock.

Now, consider the signal sent by A at 1:00 according to its own clock. B will receive it at 2:00 according to B's clock, and it will be reflected back to A along with B's 2:00 signal to be received by A at 4:00 according to A's clock. A will receive the reflected signal as deep in the infrared, one-fourth the frequency it had when it was sent out. The crew of A can now calculate that this signal, which was sent out at 1:00 and returned at 4:00, must have been reflected at 2:30, halfway between 1:00 and 4:00, because it traveled an equal distance each way. If they learn that B's clock read 2:00 at the time of reflection, they *may* think B's clock must have been thirty minutes slow. The situation is exactly parallel; B will receive its 1:00 signal return at 4:00 and its crew *may* conclude that A's clock was thirty minutes slow.

As simple as the above description may be, it's worth reviewing to see the following points:

1. A and B are equally justified in considering themselves to be at rest. This is in accordance with Einstein's postulate that all inertial systems are equivalent.
2. Both A and B consider light to travel away from the space ship at the same velocity as it returns. This reflects Einstein's postulate that the speed of light is the same in all inertial reference frames.
3. A and B observe the same red shift in the light coming from the other spaceship.
4. Sending and receiving a reflected signal shows how a distant event on a moving body can be timed.
5. Lack of agreement over the time of reflection is shown to occur even though all clocks are working perfectly. This lack of agreement isn't normally seen, because we don't usually deal with such high velocities (in this case, three-fifths the velocity of light) or super-accurate clocks. Disagreement could be avoided by A and B refusing to judge what happened at a distant point as "simultaneous" with the ticking of their own clocks.

John Geohegan was the founding president of New Mexicans for Science and Reason and currently serves as the vice president.

The workings of the "Twin Paradox" can be explained with the aid of space-time diagrams. A space-time diagram for the stay-at-home twin, A, appears in the left half of figure 2. The grid marks show years on the vertical axis and distance in light-years on the horizontal axis. The thick lines represent A's and B's positions over time, while the thin lines with arrows represent the paths of light beams sent between the twins. During the fifteen years (in A's frame of reference) of outbound travel by twin B, B gets out to a distance of nine light-years (0.6c × 15 years) from twin A. However, signals or light rays sent from B's turnaround point won't even reach A for another nine years, or until twenty-four years (15 + 9) after B's departure. That is, A will see his brother B recede for twenty-four years, and then approach for just six years, arriving thirty years after his initial departure.

This is in marked contrast to B's observations: B will see his stay-home brother recede for twelve years. After B turns around, he will see A approaching for twelve years and will return a total of twenty-four years after his departure. However, the same interval is thirty years by A's calendar. The difference is that, during the short but intense accelerations experienced by B, B's velocity relative to the universe (and to A) is *changing*. Twin B effectively "loses synch" with the rest of the universe, including his twin brother, A. Twin B is *not* in an inertial reference frame over the entire trip—and his bouts with intense accelerations will certainly remind him of that fact. Of course, A won't be aware of B's velocity changes until many years later.

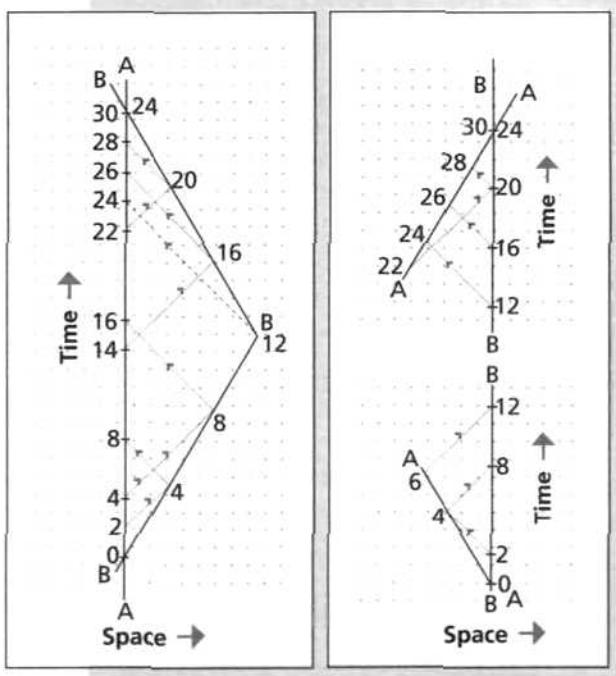


Figure 2: Twin paradox space-time diagrams for stay-at-home twin A (left) and traveler B (right).

The space-time diagrams for B's journey appear on the right of figure 2. These can't be represented as a single diagram, because they are views of two different inertial frames (B outbound versus B inbound). The twin that undergoes acceleration will be the one who returns home younger than his stay-at-home brother. The loss of synchronization due to acceleration is the key and the reason it's not a logical "paradox."

This point is crucial: the time discrepancies between the twins are absolutely real. Here is a quick example, presented with the "radar method": since any radar beams sent from A meet the target (B) at only one point in space-time, those beams must spend equal times outbound and inbound with respect to the sender. Figure 2 shows that a radar beam emitted by twin A at his time of two years will be reflected from B at some unknown time, and received again by A when his (A's) calendar reads eight years. Likewise, a beam emitted by twin A at four years will be reflected from B and received by A when his calendar reads sixteen years.

Twin A can calculate the time and distance (in A's frame of reference) of reflections from B, knowing only his own sending and receiving times and that the signals propagate at the speed of light. Since A's two-year pulse returns at eight years, the reflection occurred (by A's calendar) at the midpoint of the send/receive times, $(2 + 8)/2 = 5$ years. Since A's four-year pulse returns at sixteen years, the reflection occurred at $(4 + 16)/2 = 10$ years by A's calendar. Therefore, A measures the interval between these reflections (at five years and ten years) as being five years long.

Because the twins are separating rapidly, there will be a delay in B's receipt of A's transmissions. In particular, while A's transmissions were sent two years apart by his clock, they were received by B over an interval longer than two years, say, $K \times 2$ years, where K is a factor greater than 1. However, the same must hold true for B's "transmissions" back to A: whatever period separates the reflections from B's craft, A's measurement of receiving times will be longer—in fact, precisely K times longer—since B is moving away from A exactly as fast as A recedes from B ("relativity"). So, A's original pulses were sent two years apart; these were received by B at $K \times 2$ years apart and received again by A at $K \times K \times 2$ years apart, or eight years. Clearly, K must equal 2, and B's interval between receipt of A's two signals must be $2 \times 2 = 4$ years, while A's measurement of the time for the pulses to return from B is $K \times 4 = 8$ years, as required. This is how "Time Dilation" comes to be measured by twin A: the five-year interval that A experiences in his own frame of reference takes only four years in B's frame of reference.

Dave Thomas, a CSICOP fellow, is a physics and mathematics graduate of New Mexico Institute of Mining and Technology and is currently a senior scientist at Quasar International, Inc., in Albuquerque, New Mexico. He is the president of New Mexicans for Science and Reason.

To measure the length of a moving object, it is necessary to measure the distance to both its front and rear ends *at the same time.* Without being able to agree on what's simultaneous, different observers will measure different lengths of moving objects. This effect is called the Lorentz-Fitzgerald contraction, in recognition of the two scientists who concluded that moving objects are physically shortened in their direction of motion. This was before Einstein explained the same effect as a result of the relativity of simultaneity.

Another common misunderstanding concerns the so-called "clock paradox" (or "twin paradox"—see the sidebar on page 35), which says that if B's clock is transported to be compared with A's, it will show that less time has elapsed than will A's. This is not a paradox, because the two clocks have no longer had identical experiences. Specifically, B's clock will have been accelerated so that it could be returned to A's position. The behavior of clocks has been accurately tested, and Einstein's equations have been verified. More troublesome, though, is trying to understand what "really" happens to B's clock, or more accurately, what we "really" mean by time. We have an intuitive concept of time that resists accurate definition, and we have seen that the timing of a moving clock by sending light signals back and forth gives nonintuitive answers in experiments involving high speeds and very accurate clocks. Our intuitions work perfectly well with everyday clocks and everyday velocities, so it's a slow process trying to give up the idea of absolute simultaneity.

Perhaps the best approach belongs to Stephen Hawking: "I take the positivist viewpoint that a physical theory is just a mathematical model and that it is meaningless to ask whether it corresponds to reality. All that one can ask is that its predictions should be in agreement with observation" (Hawking and Penrose 1996). We have the model that gives accurate predictions. Perhaps a new concept of time will gradually work itself into our collective intuition as more and more practical applications of special relativity are realized.

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On Problems with Near-light-speed Travel

Forget *Star Trek*-style warp-speed (greater than the speed of light) travel and its attendant problems (like the possibility of warping through a sun). Just traveling at near-light speed could bring a host of serious problems. Take a grain of interstellar dust, for example. A tiny grain of silicon dioxide (quartz, or sand) just one micron wide (a millionth of a meter, fifty times smaller than the width of a hair) would present no problem to travelers at normal speeds. But if a spacecraft were going along at 90 percent of light speed, the innocent sand grain would appear like a high-energy missile. In fact, the relativistic calculation of the micron-sized grain's kinetic energy, as viewed by the approaching craft, would be close to 170 joules, which is about the energy of a 22-caliber bullet (40 grains, 64.8 mg/grain) traveling over the speed of sound (about 1,200 feet per second, or 366 meters per second). At such energy levels, the sand particle might even explode into a shower of protons and neutrons when it collides with the spacecraft. And a proton, traveling at 0.9c, can penetrate a stainless steel hull about 74 cm (about 2 and a half feet) thick. I don't want to burn out all the Trekkies out there, but it's worth pondering: near-light-speed travel is going to be hard.

—*Dave Thomas*

The God of Eth

Are the usual religious defenses of belief in God really up to the job? A dialogue.

STEPHEN LAW

Most people who believe in God assume their belief to be pretty reasonable. "Perhaps God's existence can't be conclusively proved," they'll say, "but it's a fairly sensible thing to believe—far more sensible than, say, belief in fairies or Santa Claus." But are they right?

Christians, Muslims, and Jews all believe that God is both all-powerful and all-good. Indeed, God is often characterized as an infinitely loving father. Yet most of the popular arguments for the existence of God allow us to deduce little if anything about his moral character. Take the argument from design, for example. Even if it can be shown that the universe does show signs of design, what's the evidence that its creator is all-good?

There is also a well-known argument that, even if the universe was created by an all-powerful being, that being is not all-good. The argument is called the problem of evil, and runs roughly as follows: if God is both all-powerful and all-good, why is there so much suffering in the world? Why does God inflict earthquakes, floods, famines, and the Black Death upon us? Why does he give small children cancer? Why does he make life so grindingly miserable for so many? Why does he arrange for millions of us to end our lives horrendously scarred—in many cases both physically and psychologically crippled—by the world he created for us? This hardly sounds like the behavior of a supremely compassionate and loving father figure, does it? Surely, there's overwhelming evidence that the universe is not under the control of a limitlessly powerful and benevolent character.

Many find this argument compelling. But of course, there are plenty who believe the problem of evil can be dealt with. How? Religious thinkers have, over the centuries, developed a number of ingenious solutions. Here are some popular examples:

The free-will solution. God gave us free will. We are not blind automata, but free agents, capable of making our own choices and acting on them. As a result of God having given us free will, we sometimes choose to do wrong. We start wars, steal, and so on. So some suffering results from our possessing free will. However, it is still better that we have free will. Free will is a very great good that more than compensates for the suffering it can bring.

The character-building solution. We know that a bad experience can sometimes make us stronger. We can learn and be enriched, through suffering. For example, people who have suffered a terrible disease sometimes say they gained greatly from it. Similarly, by causing us pain and suffering, God allows us to grow and develop both morally and spiritually. It is only through our experiencing this suffering that we can ultimately become the noble souls God wants us to be.

Some goods require evils. Theists often point out that God inevitably had to include quite a bit of suffering in his creation in order that certain important goods could exist. Take, for example, charity and sympathy. Charity is a great virtue. Yet you can only be charitable if there exist others who are needy. Similarly, you can only sympathize with someone whom you perceive to be suffering. Charity and sympathy are so-called "second order" goods that require "first order" evils like neediness and suffering (or at least the appearance of such evils) to exist. It's argued that these second order goods outweigh the first order evils, which is why God allows the evils to occur.

Play the mystery card. Some theists point out that God works in mysterious ways. It's arrogant of us to suppose that we can understand the mind of an infinitely powerful and wise being. The evil God inflicts upon us is, actually, all for the best. It's just that we, being mere humans, can't see how.

Many believe that these and other similar arguments largely take the sting out of the problem of evil. Some think they dispose of the problem altogether. I find them utterly inadequate. The following dialogue is my attempt to convey why.

Welcome to Eth, a modestly proportioned planet on the far side of our galaxy. Here, beneath the great marble spires of Eth's finest university, the debate of the age is taking place. Arrayed on either side of the university's Great Chamber are Eth's finest scholars and thinkers. They are here to decide the most controversial and emotional issue dividing the inhabitants of Eth: Does God exist?

To the right of the Great Chamber are arrayed the believers. To the left sit the skeptics. The public galleries are nearly bursting with those waiting to observe the proceedings. At the end of the debate, the audience will vote.

Booblefrip, the birdlike Professor of Origin, and Gizimoth, the portly Arch-logos Inquisitor, lead the debate.

GIZIMOTH: Here, on Eth, many of us believe in God, do we not?

BOOBLEFRIP: Certainly.

GIZIMOTH: So what is God like?

BOOBLEFRIP: Well, God is all-powerful, of course. God can do anything. He created the entire universe, including every last one of us. God's awesome power knows no bounds!

(A whisper of approval ripples across the believers on the right side of the Great Chamber.)

GIZIMOTH: Let's agree about that, then. God, if he exists, is omnipotent. But here on Eth, those who believe in God also attribute another property to him, don't they?

BOOBLEFRIP: Yes. As you know, we also believe that God is all-evil.

GIZIMOTH: Can you explain what you mean by that?

BOOBLEFRIP: Not only does God's power know no bounds, neither does his depravity. His cruelty is infinite; his malice without end.

(Booblefrip casts a cool look across the right side of the chamber.)

GIZIMOTH: I see. All powerful. And all-evil. Now Professor Booblefrip, do you think that you could briefly explain why you think it's reasonable to believe in such a being? What grounds can you provide to justify belief in this evil God?

BOOBLEFRIP: Well, I don't say I can conclusively prove beyond doubt that God exists. But it seems to me that there are at least two rather good reasons for believing in God. First, it seems obvious to me, as it does to many, that the universe must have come from *somewhere.* Don't you agree?

GIZIMOTH: Of course. The scientists assembled here will tell you that there is a perfectly good scientific explanation

Stephen Law is a lecturer in philosophy at London University. He edits the Royal Institute of Philosophy's journal Think: Philosophy for Everyone *and is the author of* The Philosophy Gym. *He has a Web site at www.thinking-big.co.uk.*

for the existence of the universe—the Big Bang. About 14 billion years ago, an unimaginably violent explosion occurred, in which all matter and energy came into existence, and in which space and even time itself began.

BOOBLEFRIP: We're all familiar with the Big Bang theory, Professor Gizimoth. But of course, the Big Bang really only *postpones* the mystery of why there is anything at all, doesn't it? For now we need to explain why there was a Big Bang. *Why* did the Big Bang happen? Science can't explain *that*, can it? There's a real mystery here, isn't there?

GIZIMOTH: Hmm. Perhaps.

***BOOBLEFRIP**: The only satisfactory explanation we have* for why the universe came into existence in the first place is that God created it. So, there's my *first* reason to believe in God.

(Gizimoth frowns—he's clearly not buying Booblefrip's argument—but he encourages Booblefrip to continue.)

GIZIMOTH: And your second reason?

BOOBLEFRIP: Take a look around you at the wonders of the universe. Life. Conscious beings like ourselves. Do you suppose that all this appeared just by *chance*? Surely not. The universe shows clear signs of design. And where there's design, there's a designer!

GIZIMOTH: But science *can* explain life. What about the *theory of natural selection? That explains how, over millions* of years, life forms evolved and developed. It explains how complex life-forms can gradually evolve from even the simplest of bacteria. Science can perfectly well explain life without introducing your supernatural designer.

BOOBLEFRIP: Natural selection can't explain everything. For example, it can't explain why the universe was set up to allow natural selection to take place in the first place, can it?

GIZIMOTH: Hmm. Well, no, it can't explain that.

***BOOBLEFRIP**: Did you know* that if the laws governing the universe had been only very slightly different, the universe would not have survived more than a second or two? Either that or it would have quickly dissipated into a thin sterile soup, incapable of producing life. For life to emerge and evolve, you need very specific conditions. The universe must be set up in an extremely precise fashion. And of course, we know that it *was* set up in just this way, don't we!

GIZIMOTH: I guess so.

***BOOBLEFRIP**: Now, that it* should just happen to be set up in just this way by chance is too much to swallow. That would be a fluke of cosmic proportions. It's much more sensible, surely, to suppose that someone deliberately designed the universe this way, so as to produce life and ultimately ourselves. That someone is God!

(Another warm ripple of approval arises from the right side of the Great Chamber. The assembled academics feel that, so far at least, Booblefrip is getting the better of the argument. But Gizimoth is perplexed.)

GIZIMOTH: Very well, let's suppose the universe *does* show clear signs of having been designed by an intelligent being.

BOOBLEFRIP: Ah, a convert!

GIZIMOTH: Not at all. I'm supposing this only for the sake of argument. You still haven't given me much reason to suppose that this designer is all-evil, have you?

BOOBLEFRIP: But God is, by definition, all-evil.

GIZIMOTH: But why define God that way? Why not suppose, instead, that God is neither good nor evil? Or why not suppose he is all-good?

(Booblefrip thinks Gizimoth has gone too far.)

BOOBLEFRIP: What a bizarre suggestion. It's obvious our creator is very clearly evil! Take a look around you! Witness the horrendous suffering he inflicts upon us. The *floods. The ethquakes. Cancer. The vile, rotting stench* of God's creation is overwhelming!

GIZIMOTH: Yes, our creator may do *some* evil. But it's not clear he's *all*-evil, is it? It's certainly not obvious that his wickedness is infinite, that his malice and cruelty know no bounds. You're deliberately ignoring a famous argument against the existence of God—the problem of good.

BOOBLEFRIP: I'm familiar with the problem of good—we theologians of Eth have been debating it for centuries. But it's not fatal to belief in God.

GIZIMOTH: Really? Let's see. The problem of good, as you know, is essentially very simple. If the universe was designed by an all-powerful, all-evil God, then why is there so much good in the world?

BOOBLEFRIP: That's the supposed problem, yes.

GIZIMOTH: Why, for example, does God allow at least some people to live out happy, contented, and fulfilled lives? Why doesn't he torture them instead? If God is all-powerful, he certainly *could* torture them, couldn't he?

BOOBLEFRIP: Well, yes, he could.

GIZIMOTH: In fact, he *could* make their lives utterly miserable. And we know that, since he is also supremely evil, he must want them to suffer. Yet, he gives some people every consideration. Why? It makes no sense, does it?

BOOBLEFRIP: Perhaps not at first sight, no.

GIZIMOTH: Here's another example. Why does God allow us to do good deeds, to help our fellow Ethians? He even allows us to lay down our lives for each other. These selfless actions improve the quality of our lives no end. So why does God allow them? Why doesn't he force us to be nasty and do evil, just like him?

BOOBLEFRIP: I grant you that the fact that God allows so much noble and selfless behavior might *seem* like very good evidence that he is not all-evil. But appearances can be deceptive.

GIZIMOTH: Also, if God is absolutely evil, why did he put so much beauty in the world for us to enjoy? Why did he create such sublime sunsets?

BOOBLEFRIP: Good question.

GIZIMOTH: And why does God give us children, who bring us immeasurable happiness? You see? There are countless ways in which our lives are enriched by God's creation.

BOOBLEFRIP: But there's also evil!

GIZIMOTH: True, there's evil in the world. But there's an awful lot of good. Far too much good, in fact, for anyone reasonably to conclude that the universe was created by an all-evil God. Belief in a supremely wicked creator is palpably absurd.

(There is much quiet nodding to the left of the Great Chamber. Gizimoth's argument has struck a chord even with the unbelievers. But Booblefrip thinks Gizimoth's argument is far from conclusive.)

BOOBLEFRIP: Look, I admit that the amount of good in the world might *seem* to undermine belief in an all-powerful, all-evil god. But actually, we believers *can* explain why a supremely evil God would allow all these good things to happen.

GIZIMOTH: By all means try.

BOOBLEFRIP: Surely you are familiar with the free-will defense?

GIZIMOTH: Perhaps you would care to explain it.

BOOBLEFRIP: Very well. God's malevolence *is* without end. True, he lets us do good. He allows us to act selflessly for the betterment of others, for example. But there's a reason for that.

GIZIMOTH: What reason?

BOOBLEFRIP: God gave us free will.

GIZIMOTH: Free will?

BOOBLEFRIP: Yes. God *could* have made us mere automata that always did the wrong thing. But he didn't do that. He gave us the freedom to choose how we act.

GIZIMOTH: Why?

BOOBLEFRIP: By giving us free will, God actually increased the amount of suffering there is in the world. He made the world far more terrible than it would otherwise have been!

GIZIMOTH: How?

BOOBLEFRIP: Think about it. By giving us free will, God can be sure we will agonize endlessly about what we should do. For free will brings with it the torture of *temptation.* And then, when we succumb to temptation, we feel guilty. Knowing that being free, we could have done otherwise, we feel awful about what we have done. We end up torturing ourselves. The exquisitely evil irony of it all!

GIZIMOTH: Hmm.

BOOBLEFRIP: By giving us free will, God allowed for far more intense and subtle forms of suffering than would otherwise be possible.

GIZIMOTH: But what about the good that people sometimes do?

BOOBLEFRIP: It's true that people do sometimes choose to act selflessly and nobly and that this can produce good. But this good is far outweighed by the additional suffering free will brings. Just take a look at the world, for goodness sake! It's a world full of people who not only behave despicably but also agonize endlessly about what they have done!

GIZIMOTH: But this is ridiculous!

BOOBLEFRIP: Why?

GIZIMOTH: Well, for a start, this only explains the good that we bring about by acting freely. It doesn't explain the existence of naturally occurring good.

BOOBLEFRIP: Such as?

GIZIMOTH: Well, what about the glories of nature: sublime sunsets, stunning landscapes, the splendor of the heavens? We're not responsible for those things, are we?

BOOBLEFRIP: No. God is.

GIZIMOTH: But why would an all-evil God create something that gives us pleasure? Also, why does he give us beautiful children to love? And why does he choose to give some people extraordinary good fortune—health, wealth, and happiness in abundance? Surely, the existence of these goods provides us with overwhelming evidence that, even if the universe has a creator, he's not *all* bad?

BOOBLEFRIP: You're mistaken, Gizimoth. Such things are exactly what we should expect if God is supremely evil.

GIZIMOTH: But why?

BOOBLEFRIP: Some natural beauty is certainly to be expected. If everything was uniformly ugly, we wouldn't be tormented by the ugliness half as much as we are when it's laced with some beauty. To truly appreciate the ghastliness of the environment most of us inhabited—urine-stained, concrete-and-asphalt wasteland peppered with advertising billboards, drug addicts, and dog dirt—we need to be reminded every now and then that things *could* be different. God put some natural beauty into the world to make our recognition of the ugliness and dreariness of day-to-day life all the more acute.

GIZIMOTH: Hmm. But why would a supremely wicked God give us beautiful children to love?

BOOBLEFRIP: Because he knows we'll spend our entire lives worrying about them. Only a parent can know the depth of torture a child brings.

GIZIMOTH: Why does he give us healthy, young bodies?

BOOBLEFRIP: He makes sure that both our bodies and their vitality and health are short-lived. You see, by giving us something and then snatching it away, our evil creator can make us suffer even more than if we had never had it.

GIZIMOTH: *But then, why does God allow some people* to live out such contented lives?

BOOBLEFRIP: *Of course* an evil God is going to bestow upon a few people lavish lifestyles, good health, and immense success. Their happiness is designed to make the suffering of the rest of us even more acute! We'll be wracked by feelings of envy, jealousy, and failure! Who can be content while others have so much more!

GIZIMOTH: Oh, honestly!

BOOBLEFRIP: Don't you see? The world clearly was designed to produce life—to produce conscious beings like ourselves. Why? So that its designer can torture us. The world is designed to physically and psychologically crush us, so that we are ultimately overwhelmed by life's futility and bow out in despair.

(Gizimoth is becoming frustrated. Every time he comes up with another piece of evidence that the universe wasn't designed by a supremely evil deity, Booblefrip turns out to have yet another ingenious explanation up his sleeve. And yet, thinks Gizimoth, the evidence against the existence of an utterly evil God is *overwhelming.)*

GIZIMOTH: This is ridiculous. You have an answer for everything!

BOOBLEFRIP: Yes, *I do* have an answer to all your arguments. So far, you've given me not the slightest reason to suppose that the world was not created by a supremely evil being. But if you're unhappy with my answers, let me try a rather different approach. There are some evils that require good in order to exist, aren't there?

GIZIMOTH: Such as?

BOOBLEFRIP: Take the evil of jealousy. Jealousy requires something to be jealous of. God gave good things to *some* people so that others would feel jealous. Or take lying. Lying requires that people often tell the truth—otherwise, there would be no point in lying, because no one would believe you. The evil of dishonesty requires that there be a certain amount of honesty.

GIZIMOTH: *And you think this evil outweighs the good* it depends on?

BOOBLEFRIP: Exactly. God allows *some* good things into his creation. It's the price he has to pay for the greater evil.

GIZIMOTH: These tricky replies of yours are patently absurd. You can't seriously maintain that the world you see around you—a world full of natural beauty and laughing children—is really the handiwork of an infinitely evil God?

BOOBLEFRIP: I do maintain that, yes. True, I may not be able to account for every last drop of good in the world. But remember that we are dealing here with the mind of God. Who are you to suppose you can understand the mind of an infinitely intelligent and knowledgeable being? Isn't it arrogant of you to suppose that you can figure out God's master plan?

GIZIMOTH: I'm *arrogant*?

(There's some subtle nodding from the believers on the right.)

BOOBLEFRIP: Yes, arrogant. Evil God works in mysterious ways. Ultimately, everything really is all for the worst. It's just that, being mere humans, we can't always figure out how.

GIZIMOTH: Oh, really. This is—

BOOBLEFRIP: I think it's arrogant of you to suppose otherwise—to suppose that *you* must be able to figure it all out.

(At the end of the debate, the audience votes. After the deliberation, a spokesperson steps forward with their verdict.)

SPOKESMAN: It seems to us that Booblefrip has made a powerful case for supposing the world was created by God. In addition, Booblefrip has provided a compelling defense of belief in this evil being. He has successfully explained why even an evil God would allow a great deal of good. And so the motion is carried—we are persuaded that Evil God exists.

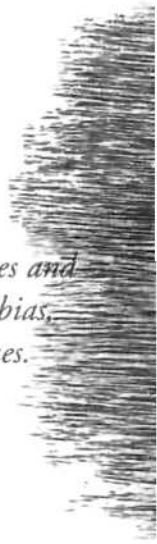
Are you persuaded by Booblefrip's defense of belief in a supremely evil God? Of course not. His explanations are clearly utterly feeble. Surely, despite all of Booblefrip's convoluted maneuverings, the fact remains that belief in a supremely evil God is patently absurd.

But of course, Booblefrip's defense merely flips around the standard explanations that theists offer in defense of belief in a good God. His attempts to explain what good there is in the world mirror the theist's attempts to explain the evil. If Booblefrip's explanations are deeply inadequate, why aren't the theist's explanations? That's the question theists needs to answer.

Of course, theists consider belief in an all-evil God to be downright silly. And rightly so: there's clearly far too much good in the world. So why is it that they consistently fail to recognize that the sheer quantity of suffering in the world renders their belief in an all-good God equally silly? Surely, even if the universe does have a designer/creator, isn't it patently obvious that this being is neither all-evil, nor all-good? □

Palm Readers, Stargazers, and Scientists

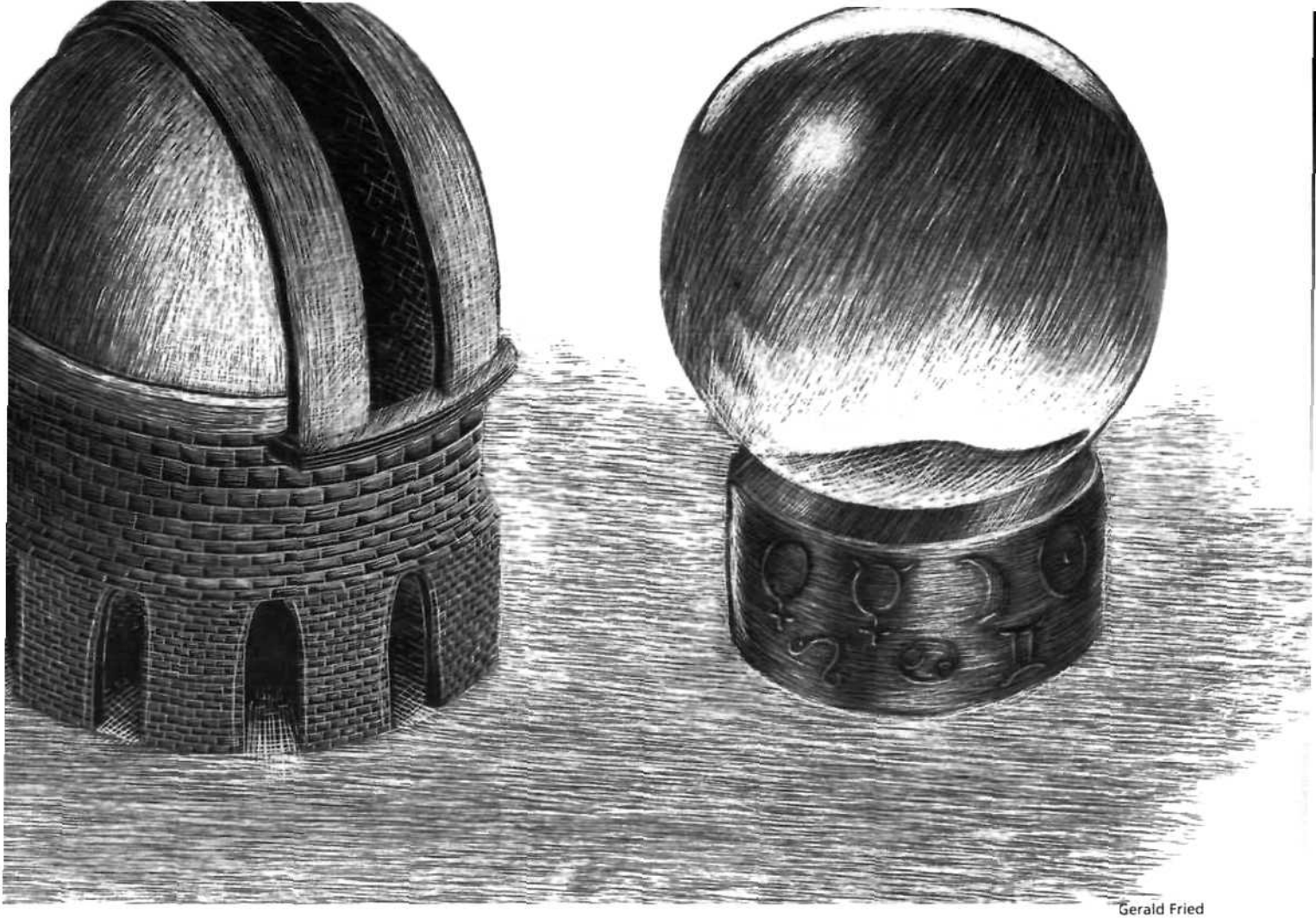
A Critique of Futurism



Scientific futurism is not that different from psychic futurism. It serves many of the same purposes and is subject to many of the same cognitive biases including belief perseverance, the confirmation bias, and the assimilation bias. Protecting ourselves from both involves similar skills and techniques.

RICHARD L. MILLER and EMILY BALCETIS

By the year 2000, America's energy crisis should have been solved by aliens, New York City should have disappeared, and the presidency should have been held by five individuals simultaneously (Wallechinsky and Wallace 1978). While a number of notable events occurred that year, none of these futuristic predictions became reality. Each year, the SKEPTICAL INQUIRER provides a review of the New Year's predictions by psychics, and each year, the list is full of unfulfilled but readily forgotten predictions. Thus, 2004 was not the year Osama bin Laden died, Colin Powell was elected president, or the Hoover Dam collapsed (Bin Laden Dead, Powell President? 2005).



Gerald Fried

However extraordinary futuristic predictions may appear, and however inaccurate they are, their sense of mysticism, and the popularity resulting from them, does not decline. A naive population continues to accept futuristic foretelling as a valid means of understanding current situations and planning for the future.

Psychic Futurism

David Wallechinsky and Irving Wallace, in their 1978 almanac, provided a host of futuristic predictions, the accuracy of which we can now examine. Among notable futurists, an eccentric television performer named Daniel Logan used his psychic powers to benefit those curious about the futures of famous actors. Working through a spirit guide, Logan declared that by 1980, Lucille Ball would hold the position of ambassador to an Asian country.

Technological advances in society represent another popular topic for psychic prediction. Kebrina Kinkade, who is nationally recognized for her ability to accurately prophesy for fellow celebrities, reported that by the year 2000, solar cars would be marketed inexpensively and be widely used. Likewise, Russian and American joint travel to Saturn and Mars would be possible through contact with alien life. Jeane Dixon, real-estate agent turned Hollywood psychic, foresaw that by 1999, the U.S. and its allies would be at war with Russia and its satellites as Russia would shower U.S. coastal cities with a nuclear holocaust. But a re-enactment of Moses's parting of the Red Sea would make the Russians incapable of destroying the world, as an intervention by God would decimate their armies.

This is the year 2005. Lucille Ball is no longer with us, traveling is still accomplished with automobiles that roll along pavement, and the world remains free of nuclear wars and mass drownings in the Red Sea. It is safe to state that these futurists were incorrect in their predictions.

Richard L. Miller is a professor and the chair of psychology at the University of Nebraska at Kearney, where he is Director of the Institutional Review Board for the Protection of Human Subjects in Research. His main research interests are social influence, social cognition, and environmental psychology. He can be contacted at the Department of Psychology, University of Nebraska at Kearney, Kearney, NE 68849 and his e-mail address is: millerrl@unk.edu. Emily Balcetis is a third-year graduate student in the social psychology doctoral program at Cornell University. Her research interests include self-deception and social cognition.

Many psychics claim to receive their powers from divine intervention, miraculous discoveries, or an inheritance of the rare trait of prediction. However, futuristic predictions are also found in academia. Scientific futurism is the scholarly form of psychic prediction. As opposed to crystal balls, tarot cards, and palms, scientific futurists rely upon hypotheses, theories, and postulates. Although the scientific predictions may be offered by what appear to be perfectly credible sources, their reliability is often just as tarnished as that of the Hollywood psychics.

As our knowledge of the world changes and grows, the laws that govern these changes must be re-examined. **Superstring theory**, for example, may provide a **solution** to the irreconcilable differences of quantum mechanics and the general theory of relativity.

Scientific Futurism

Knowledgeable experts make claims that attempt to provide order and certainty about the future. As research is conducted and data is collected, limited conclusions can be drawn. Sometimes, generalizations from this sample are made that extend beyond the researcher's understanding, and inaccurate predictions are made. Such can be the case when experts look at current trends and attempt to predict future tendencies. The Nobel Prize-winning physicist Albert Michelson said in 1903, "The most important fundamental laws and facts of physical science have all been discovered, and these are now so firmly established that the possibility of their ever being supplemented in consequence of new discoveries is exceedingly remote." Although Michelson and his colleagues developed a means to measure the speed of light, they did not foresee that this development would lead to examination of other physical phenomena. As our knowledge of the world changes and grows, the laws that govern these changes must be re-examined. Superstring theory, for example, may provide a solution to the irreconcilable differences of quantum mechanics and the general theory of relativity. Superstring theory, if confirmed, may establish a basis for determining the central point of a black hole and the origin of the Big Bang through the combination of quantum mechanics and relativity, all of which went undiscovered until well after Michelson's death.

Thomas Watson, the founder of IBM, once stated, "I think there's a world market for about five computers." Since the first computer system required a unique cooling system, demanded hundreds of square feet of space for 19,000 vacuum tubes, weighed thirty tons, and cost over $485,000 to construct, it is not surprising that many would have seen this advance as limited in its practicality. Watson was unable to predict how reductions in size, cost, and complexity would make the computer a reasonable home and occupational accessory. Watson was not alone in his surprise at the computer revolution. In 1981, Bill Gates, founder of Microsoft, believed that "640K [memory] ought to be enough for anybody."

Skeptical about aeronautical advancements, Lord Kelvin, the noted British physicist, proclaimed in the 1890s that "heavier-than-air flying crafts are impossible." It should be noted that his prediction flew in the face of considerable evidence that flight was not only possible but likely in the near future. Drawings and plans by Leonardo da Vinci were suggestive, but actual evidence was available in the work of Sir George Cayley of Great Britain. In 1804, Cayley created a successful glider that acted like a modified kite. In 1848, Cayley partnered with William Henson and John Stringfellow to create a steam-driven model plane that could lift part of its weight. German Otto Lilienthal flew 2,000 glider flights successfully and contributed to measures of balance and control. Thus, on December 17, 1903, only eight years after Kelvin's remark, the Wright brothers launched the first controlled and powered flight of a heavier-than-air flying machine that carried a man. However intelligent, scholarly, and celebrated he may have been, Lord Kelvin was not able to foresee this development.

"Space travel is utter bilge," commented Richard Woolley, the United Kingdom's Astronomer Royal, in 1956. One year later, Russia launched the first Sputnik into outer space. Although Woolley was a recognized expert on space, his statement is a good example of how even scientists can make poor futurists. Although credible and legitimate authorities, academic experts are not necessarily accurate futurists. Emphatic and definitive statements will often be found to be in error as current knowledge is re-examined, modified, and exchanged for new theories. An inability to obtain all available information, especially when it's kept in secret by competitors, hinders the accuracy of predictions. Thus, when examining the validity of predictions, a noted specialist may not be a legitimate authority when predicting outside of his area of expertise.

A more recent example is Paul Ehrlich, a futurist who gained notoriety for predictions on overpopulation. Convinced that mass famine and economic devastation would destroy the world, Ehrlich repeatedly set deadlines for the destruction of the world and pushed them forward after the deadlines were not met. Given the economic difficulties of the 1960s, Ehrlich stated in the 1968 book, *The Population Bomb*, that the 1970s and 1980s would bring an unavoidable and pervasive famine and disease that would kill hundreds of millions of people.

Believing that overpopulation was a cancer that needed to be halted, Ehrlich proposed the implementation of compulsory governmental programs to decrease childbirth and subsequent famine. Ehrlich's predictions have not been

realized, and thus the implementation of his suggestions has not been necessary. Growth in agricultural education, technology, and communication changed the equation, so that deaths from famine have declined enormously. Arthur C. Clarke wrote (1973, 14): "When a distinguished but elderly scientist says that something is possible, he is almost certainly right. When he states that something is impossible, he is very probably wrong." Ehrlich did not think it was possible for us to increase the world's food supply or to decrease its population. His predictions of famine and economic devastation have been proven wrong. In contrast, Clarke predicted communication via satellites in geosynchronous orbit decades before its existence. To do so, he assumed reasonable progress in rocketry and related that to what was known about orbits and celestial mechanics. Futuristic predictions are often wrong because the process of extrapolating the future from what we know now can be inherently flawed. Events, discoveries, and scientific breakthroughs can all dramatically alter the possible.

Regardless of their sources of inspiration and material, psychics, academic futurists, and fortune-tellers continue to have an *impact on society by disrupting conven*tional practices grounded in scientific fact (e.g., medical treatment) and providing sometimes bogus solutions to a hungry audience. Their claims can be unsubstantiated, invalid, and horrendously incorrect, but the desire for clairvoyant futurists remains unaltered. Why does the public yearn for myth, rumor, legend, and prediction when the answers are often bogus?

The Purposes of Futurism

If prediction is such a hit-and-miss operation, why is it that our best prediction about the future is that human beings will go on making predictions? One reason is that human beings value certainty and work hard to reduce anxiety and insecurity. When the world seems to spin out of control, with economic downturns, violent crime, and a rapidly changing culture, many people seek to regain control over their lives by grasping for the simplified explanations and predictions provided by psychics, gurus, and pseudoscientists. Unlike science, with its air of tentativeness and focus on general trends, pseudoscience speaks a language of certainty and specificity: Here is what *will* happen to you. Another appealing characteristic of pseudoscience is its personal and dramatic quality, based, as it often is, on compelling anecdotes or individual experience.

Regardless what the data show, people continue to believe in fantasy, erroneous claims, and fiction. Claiming that their position is supported by investigative studies, people will maintain outdated beliefs and disregard contradictory evidence. Research cited to support opposing sides often stems from identical bodies of knowledge. Michael Levy, in his book *Tools of Critical Thinking* (1997), describes several cognitive biases and fallacies that lead us to believe that which we should view skeptically.

The Assimilation Bias

This bias causes us to view the world selectively through schema-colored glasses. Because of our propensity to categorize, classify, organize, and structure our world, we create boxes into which we try and fit information. Depending on the size and shape of the box, the information we try to fit may become distorted. For example, many Americans use their political philosophy as a kind of structure through which to filter information. In the 2000 debates, for the Republican party nomination for president, both George W. Bush and John McCain quoted the same study as they took opposing sides on the issue of Texas's educational test scores in reading. Bush reported that scores have risen in the last few years even as McCain proclaimed that they were at their lowest ever. Both candidates selected only the relevant details from the study to share with the public while ignoring the data that contradicted their position. This selection bias often appears outside of politics. In a study by Charles Lord and his associates (1979), college students who were either in favor of or opposed to capital punishment were provided with contradictory evidence as to its efficacy. Both groups of students were impressed with the evidence and found it to be supportive of their prior belief. Individuals may get fixed in their ways and acquire an inability to consider alternative viewpoints or suggestions that don't fit into their particular boxes.

Unlike science, with its air of tentativeness and focus on general trends, **pseudoscience** speaks a language of certainty and specificity: Here is what ***will*** happen to you.

Belief Perseverance

This bias causes us to hold on to predictions that have already been disconfirmed. Often, beliefs can become personal investments that are difficult to extinguish. This is especially true when the prediction has extrinsic value to the audience. In many cases, our beliefs become so intractable that we will stubbornly persist even in the

face of clear, disconfirming evidence. In a study by Ross, Lepper, and Hubbard (1975), participants were administered a personality test and given false feedback about its results. The participants were subsequently informed that the test had been a fake. Even with this knowledge, however, the participants persisted in believing the original results that they had been given.

Confirmation Bias

When formulating opinions and collecting data for those opinions, people have a tendency to seek confirmatory evidence as opposed to information that negates the point—a phenomenon known as *confirmation bias.*

Many futurists appeal to anti-elitist sentiments. Scientific truths often require educated seers for their interpretation, while almost **anyone can claim** to be a **psychic.**

Gilovich (1991) summarizes several studies that required participants to determine whether a study subject possessed a specific personality trait. Most often, participants asked questions that, when answered positively, would confirm the hypothesis. For example, when questioning if the person is extroverted, participants may have asked how to liven up a dull party. Yet, what is not considered is that even introverts are able to answer this question. In asking the question, the participant has gained no information but has extracted a false sense of confirmation. A grossly inaccurate prediction may be perpetuated by faulty data collection techniques. In this way, disconfirmed predictions can be maintained without actual support.

Michael Shermer (1997) has spent two decades unearthing the rational explanations for fire walking, futurism, UFOlogy, alien abduction, and denial of the Holocaust. He has gathered opinions from skeptics and scientists explaining why society maintains a belief in psychic futurists and continues to accept unsubstantiated claims as truth. He suggests that these beliefs stem from a lack of education and critical thinking, the rise and decline of religion, the growth of cults, an influx of television viewing, poor parenting combined with inadequate teachers, and simple ignorance. Shermer suggests that our culture has difficulty in making a distinction between science and pseudoscience. Beliefs that offer comfort and ease are accepted regardless of their source.

Futurists can provide psychological comfort. Knowing what will happen is much more palatable than uncertainty. The ease of having life's answers only a phone call away is too tempting for the lonely, the confused, or the anxious to pass up. Psychics can proclaim what the future will hold while scientists dwell in the past. Psychics say they can help paying customers prepare for the future, while scientists can only help people deal with today. Psychics reduce uncertainty by providing simple, definitive answers while scientists often bring more questions. At a mere $3.95 per minute, the future can be known today.

Futurists not only provide solutions to perpetual problems and questions, they also offer order in chaotic situations. With order comes predictability and preparedness for upcoming events. Thomas Gilovich explains that perhaps the fascination with order and understanding stems from a genetic predisposition and evolutionary process. The discovery of patterns and subsequent predictions allows for technological advances and progress. He describes the conception of antisepsis as stemming from patterns of infection in women who had just given birth with the help of doctors who had just performed a dissection. Likewise, Darwin's investigation of relationships between the varying species of finches led to his formulation of evolutionary models and natural-selection theories. However, humans continue to search for patterns even when the results are misleading. Children find the man in the moon. Adults see obscenities drawn into the backgrounds of Disney movies. Biological and evolutionary theorists who attempt to explain our tendency for pattern searching suggest that it is human nature to associate, categorize, and establish order.

In his book *Paranormal Beliefs: A Sociological Introduction,* Erich Goode (2000) suggests that there are several sociological reasons for people's belief in futurist nonsense. First, the predictions of futurists can be dramatic and entertaining, certainly when compared with scientific prediction. Second, many futuristic predictions are founded in ancient and enduring symbolism with themes that resonate with our daily hopes and fears. Third, many futurists appeal to anti-elitist sentiments. Scientific truths often require educated seers for their interpretation, while almost anyone can claim to be a psychic. Finally, many people profit from futurism, sometimes accumulating fame and fortune.

According to Geoffrey Dean's investigation of astrological claims (Dean 1986, 1987 and cited in Tavris 2001), part of the enduring appeal of pseudoscientific predictions has to do with the difference between the question "Does it work?" and the question "Is it true?" Thus, predictions based on astrology often make people feel comfortable: in other words, they "work." However, astrological predictions seldom score better than chance at being true. For example, the U.S. Geological Survey once examined the claimed ability of astrologers, psychics, and amateur geologists to predict future earthquakes. The accuracy rate for each of these groups was actually less than if they had guessed randomly.

Skeptical Approaches to Futurism

What can we do to protect ourselves from futuristic foolishness? While a general skepticism is probably a healthy trait, it can too easily turn into endemic cynicism and a "will *not* to believe." So how do we sort out the likely from the unlikely? Four approaches come to mind. First, we must understand the limited reach of empiricism. Scientific research and prediction are worthy of respect but not unquestioned acceptance. How far can scientists generalize from their data? Conclusions based upon empirical findings are a valuable part of the scientific enterprise. Generalizations that far outstrip actual scientific findings should always be looked at skeptically. Asking whether or not the conclusions drawn by the scientist are the only conclusions that could be drawn given the methodology of the research, the nature of the subject sample, and the procedures used in a study are all steps toward being able to think critically about any sort of futuristic prediction.

A second approach to evaluating a prediction is to examine the basis for it. In science, one study means little, but replication (both conceptual and methodological) provides us with a basis for greater certainty. In the behavioral sciences, population sampling plays a key role in making accurate predictions. Thus, companies that wish to predict the results of political campaigns typically sample fewer than 1,500 people in order to accurately predict the behavior of 100 million. The key to this is picking 1,500 people who are *representative* of the population the pollster wishes to describe. Thus, a survey with 100,000 respondents may or may not tell you anything about the population being studied despite the size of the sample.

Many predictions have lengthy gestation periods. Must we wait the full ten years to see if certain long-term predictions come true? Not really. In many cases, the skeptic could reasonably describe benchmarks and milestones that would suggest whether or not a particular prediction is becoming more or less likely as the target date approaches. For this technique to work, however, the benchmarks and milestones must be laid out ahead of time. Humans are amazingly capable of finding evidence that an expectation is likely to be fulfilled. Our ability to distort reality goes beyond just bending the facts a bit to discover trends. In a study on subliminal persuasion, Tony Pratkanis found that individuals who listened to what they thought were diet tapes found "evidence" that they had lost weight despite the unchanging numbers on their scales (Pratkanis and Aronson 1992).

Finally, forewarned is forearmed. To the extent that we are aware of the fallacies and biases that lead to the "will to believe," we may have a tool to counter the myriad claims of the predictors.

There is much to admire about the progress made by science. However, we must be skeptical in our acceptance of the evidence offered by scientists, just as we are of the claims and advice proffered by pseudoscientists. Thinking skeptically includes such skills as examining the evidence, being aware of the biases that cloud our judgment, questioning our assumptions, and not oversimplifying. Given that much of what we currently know will change in subsequent years, it is less important to dispel specific erroneous beliefs (although there is merit and certainly humor in that) than it is to understand how erroneous beliefs come to be. To better prepare ourselves against false beliefs, we need to learn about the ways in which we can be misled by the apparent evidence of everyday life. This, in turn, requires that we think clearly about our experience, question our belief systems, tolerate ambiguity and uncertainty, and critique favored conclusions.

There is much to **admire** about the **progress** made by **science**. However, we must be skeptical in our acceptance of the evidence offered by scientists, just as we are of the claims and advice proffered by pseudoscientists.

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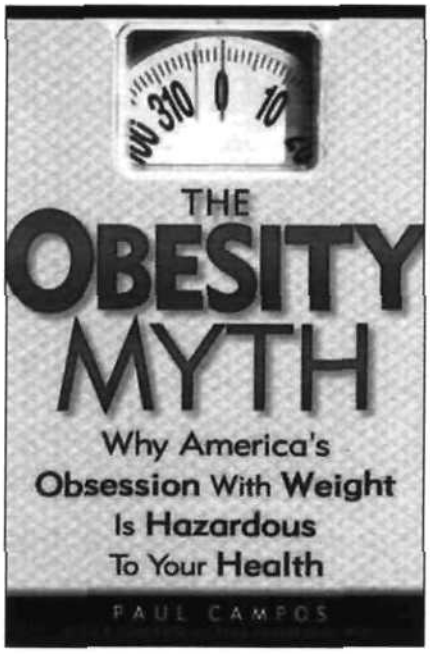
Questioning the Obesity Myth

BENJAMIN RADFORD

The Obesity Myth: Why America's Obsession with Weight Is Hazardous to Your Health. By Paul Campos. Gotham Books, New York, 2004. ISBN 1-592-40066-3. 290 pp. Hardcover, $25.



At a June 2, 2005, press conference, Dr. Julie Gerberding, the director of the Centers for Disease Control and Prevention, apologized for the mixed messages the public has been getting about the dangers of obesity. Acknowledging that flawed data in several CDC studies had overstated the risks of obesity, Gerberding was responding in part to critics such as Paul Campos. Campos rightly sounds the alarm over bad science, and his book *The Obesity Myth* (reissued in May 2005 as *The Diet Myth*) was prominently featured in a recent *Scientific American* cover article.

The book and controversy provide an object lesson in skepticism. Campos is not a medical professional but a lawyer; he makes a point of mentioning this, implying that his status as an outsider to the obesity issue aids his judgment. It is important to remember, however, that lawyers do not seek the truth; instead, they advocate for one side. In this case, Campos is advocating on behalf of those who believe that the efforts to portray fat as unhealthy and unacceptable are driven by junk science, hatred of fat people, and a profit-hungry dieting industry. He also believes that the time-honored weight loss recipe of watching what you eat and exercising doesn't work. Campos charges that "almost everything the government and the media [are] saying about weight and weight control [is] either grossly distorted or flatly untrue." The whole field is rife with "junk science," Campos writes, and former Surgeon General David Satcher was "unhinged" in his efforts to curb America's obesity.

It is certainly true, as Dr. Gerberding admitted (and Patrick Johnson explains in this issue), that various estimates of obesity's death toll were consistently overstated. While Campos and other critics can gloat in vindication, the fact is that obesity is only the latest in a long list of public health threats that have been overstated by a sensationalist news media (and, to a lesser degree, by the medical community). The dire warnings, publicity, and hype surrounding West Nile virus, ebola, flu, anthrax, Mad Cow disease, and even AIDS, to name just a few, all far outstripped any reasonable public health threat. And confusing and contradictory medical information is hardly novel, as William Baarschers describes in his article in this issue.

Campos devotes two valuable chapters to the junk science behind the obesity scare. The remaining sixteen chapters, however, are devoid of skepticism. Throughout Campos's book, he adopts a crusading tone and blames the news media and medical journals for getting their facts wrong and presenting a biased viewpoint. So how does *The Obesity Myth* stack up?

Let's start with Campos's subtitle. Does America have an obsession with weight? Campos certainly seems to think so; he calls America "a nation of dieters." Campos seems unaware that—despite health advice from doctors—most Americans are in fact *not* trying hard to lose weight. Studies and surveys find that while some Americans are dieting, a majority are not, and a surprising percentage—one-third to one-half—*rarely or never diet.* According to a 2002 survey published in *USA Today*, only one out of every five women said losing weight was a top priority. In 2000, a *People* magazine survey found only one-quarter had dieted

Benjamin Radford wrote about exaggerated media claims in the March/April 2005 issue of SKEPTICAL INQUIRER, *based on his book* Media Mythmakers: How Journalists, Activists, and Advertisers Mislead Us.

at any point in the previous year. Studies published in medical journals have found similar results. For a book that repeatedly criticizes others for exaggerating numbers, Campos starts out on poor footing.

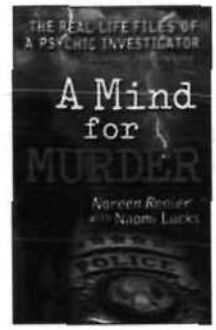
Campos compounds this factual error with a logical one by suggesting that "advising people to eat less and exercise more appears to have ended up making Americans a good deal fatter" (p. 33). He is mistaking correlation for causation, but the misunderstanding goes far deeper than that: Campos is assuming—incorrectly—that Americans have been following the advice to eat less and exercise more. In fact, studies have found that most Americans eat poorly and don't exercise regularly.

Wrongly convinced that most Americans are dieting, Campos blames the "fat police" medical establishment and the *media for causing low self-esteem in* women. "Few Americans—and especially very few American women—are satisfied with the appearance of their bodies," Campos writes on page 174. The zealous skepticism with which he attacked the CDC's inflated numbers is absent when it comes to examining his own assumptions. In 1998 *USA Weekend* conducted one of the largest surveys ever taken of American youth, surveying over a quarter of a million students in grades 6 to 12. Among the results: 93 percent of teens feel good about themselves. A recent Gallup poll of more than five thousand adults found that 90 percent of Americans are confident in their looks. In 2000, the British Medical Association issued a report that concluded "The majority of young women (88 percent) say they are of average or above average self-confidence." And a 2004 survey, "The Real Truth About Beauty: A Global Report" (coauthored by feminist Susie Orbach who, ironically, provided a cover blurb for *The Obesity Myth*) found that only ten percent of women were "somewhat or very dissatisfied" with their beauty. The facts show exactly the opposite of what Campos claims.

In much of the book, Campos denounces popular culture's obsession with thinness. While thin bodies are undeniably present in entertainment media, large bodies are just as present, from Oprah Winfrey to Roseanne Barr and Kirstie Alley, *American Idol* Ruben Studdard to Starr Jones and Queen Latifah. Bizarrely, Campos cites very thin models and actresses like Kate Moss and Calista Flockhart as being the "cultural ideal." He offers no support for this claim (ideal according to whom?) and seems unaware that both Moss and Flockhart were continually and harshly criticized—not lauded—for their thin bodies.

Then there's the howler on page 121 that "obesity researchers rarely seem to be given pause by the fact that life expectancy and obesity rates in America have been rising in tandem for at least a century now." It seems likely that improved sanitation and decreasing infant and child mortality rates since 1900 are *responsible for increased life expectancy.* Furthermore, the incidence of obesity has steeply increased in the last twenty years, and the diseases associated with obesity may take years to actually kill.

In what is the final irony, on page 241, Campos reveals that, in the course of writing the book, he managed to lose 30 percent of his body mass. How did he do it? Why, diet and exercise—the method that the medical establishment and the "unhinged" Surgeon General had touted, the exact recipe Campos had repeatedly assured his readers (pp. 8, 29, 119*) never works. The Obesity Myth* does indeed puncture several myths about dieting and obesity; unfortunately it creates and perpetuates more myths than it debunks. The book is a good lesson in the importance of being skeptical not only of others' assumptions and *beliefs, but also our own.*



These Files May Be 'Real-Life'—But Is She Really 'Psychic'?

GARY P. POSNER

A Mind for Murder: The Real-Life Files of a Psychic Investigator. By Noreen Renier with Naomi Lucks. Berkley Books, New York, 2005. ISBN 0-425-20289-5. 310 pp. Paperback, $7.99.

The foreword to *A Mind for Murder,* Noreen Renier's memoir of her career as a "psychic investigator," begins, "I have had my throat slit. I have been shot. . . . I don't like to get killed more than two or three times a week—it's just too exhausting." I found the entire book an entertaining adventure—it's a page-turner, and the writing isn't half-bad. But are the author's "psychic" claims even half-true?

Boasting endorsements from retired FBI criminologist/author Robert Ressler (among others in law enforcement and parapsychology research), Renier is the only psychic to have lectured at the FBI Academy. She says she has worked on "more than four hundred unsolved homicides, missing persons, and rape cases."

Renier's 1986 libel trial against skeptic John Merrell and their ensuing legal battles, thoroughly addressed in my contributed chapter about Renier in the book *Psychic Sleuths,* occupy two chapters. But she leaves out the most delicious tidbit: She enticed (some might

Gary P. Posner is founder of Tampa Bay Skeptics and a CSICOP Scientific Consultant. All of his published writings about Noreen Renier, including an expanded version of this book review, are accessible from his Web site (http://members.aol.com/garypos) by clicking on Noreen Renier's name.

say entrapped) Merrell into a comprehensive investigation of herself by writing to him *under an assumed name.*

How Renier discovered her "psychic" powers reads more like fiction than fact to me. But I can no sooner dismiss those stories than I can her versions of many of the book's "real-life files," such as when a detective invited her to help rid a home of a poltergeist, or her first murder case, in which she divined the probable killer—a police officer—though, due to lack of tangible evidence, he was never charged.

In the New York Zodiac Killer case, she holds an object from a victim, reads the vibrations (through "psychometry"), and "becomes" the killer. Speaking as Zodiac: "I have black hair, it's curly . . . I speak Spanish well." But what about *her own name?* In the book she claims to have come up with "Eduardo" for the NYPD. But she had no such luck when I saw her do a similar Zodiac reading on the *Joan Rivers Show.*

Renier is perhaps best known for three predictions relating to the 1981 assassination attempt on President Reagan. The first was in November 1980 during her radio program in Charlottesville, Virginia: "I'm feeling problems in [Reagan's] chest. If it's not a natural problem, perhaps it will come from outside." A heart attack would have also been a "hit." According to *The Blue Sense,* singled out by Renier for its "kind words about me," two years earlier she had predicted that President Carter would be assassinated and that Vice President Mondale would commit suicide.

Her second Reagan prediction appeared in the *National Examiner* tabloid, saying Reagan would be shot in the left upper chest but not killed. Was it merely a lucky guess? Was it even accurately presented and attributed? During the 1986 libel trial she said the tabloid made up several failed predictions that accompanied the Reagan forecast.

The third Reagan reading occurred during a January 1981 lecture at the FBI Academy in Quantico. Robert Ressler has testified, "She said she felt that Reagan was having a heart attack in the future . . . some sort of chest pains . . . and then clarified . . . it is a gunshot . . . she was patting her left side . . . and that he would not die." But Ressler's contemporaneous description to fellow agent Richard Ault, who missed that Renier lecture but attended at least two others, left him nonplussed. As quoted in *Psychic Sleuths*: "The way [Ressler] described her prediction . . . it sounded pretty general."

In Ressler's 1992 book, *Whoever Fights Monsters: My Twenty Years Tracking Serial Killers for the FBI,* he mentions that Renier "helped to locate a [downed] plane containing the body of a relative of an FBI agent." The incident occupies a chapter of *A Mind for Murder* and was covered extensively in *Psychic Sleuths.* The local newspaper reported that the small plane's wreckage was actually found in a search "based on reports from two area pilots who [had] witnessed [the] crash." Renier's version mentions no witnesses and credits her "psychic" clues. Even more curious is Renier's contention that the relative had briefly survived: "They found the body of [the agent's relative] . . . sitting on the side of a hill. . . . It was clear to everyone that he had been alive when he left the plane." In reality, the NTSB determined that all four occupants had "died immediately" upon impact.

With regard to the 1994 disappearance of a man and his truck in Williston, Florida, though the police credit her valuable clues, unmentioned in Renier's book is that they knew the man had been contemplating suicide in one of the area's many quarries. They searched about thirty of them, but did Renier's clues really point to the correct one? The man's body and truck were found 2.1 miles from his home, adjacent to State Route 45—supposedly "hits" for Renier's clues about the numbers 21 and 45. But Renier fails to mention a police audiotape in which she says, "Maybe 4, maybe 5. If it's 45 miles, if it's 4.5 miles. . . ."

Detective Ray Krolak credits Renier with helping him solve a double-homicide in upstate New York, her book alleging that she fingered the dead couple's grandson as one of the killers. As noted in *Psychic Sleuths,* during a 1991 *Geraldo* show, the grandson's mother asserted unequivocally, "She did not do that. She did not finger my son." Though both Renier and Krolak were present, neither disputed her.

Renier says in the book, "But even though there's no way I can prove to you I'm a psychic, I don't mind being challenged." Yet while she was living near Orlando, the Tampa Bay Skeptics (which I founded in 1988) offered her our "$1,000 Challenge." While open to any mutually agreeable protocol, we suggested a "psychometry" demonstration infinitely easier than the many described in her book. An object of hers, such as a ring, would be sealed in an envelope. Similar objects from other people would be sealed in similar envelopes. Renier's task would simply be to determine (enough times in a row to achieve greater than one in a million odds of success by chance) which of the envelopes was emanating *her own* vibrations, as opposed to those of a stranger. Regrettably, she declined.

Her book contains many beguiling stories. But with "more than 400" cases to choose from, might 350 or more be clinkers? Is it time to rewrite our science textbooks to include a chapter on the reality of "psi"? And is it possible that she pre-researches the extensive press coverage of crimes and cases she's asked to consult on? Regardless, stories such as the following will hopefully open the minds of at least some close-minded believers to the likelihood that Renier's readings are but flights of fantasy: "I was told by the ancient oak, 'We have one fear and that is of fire. Would you mind not smoking while you're touching me?' Stunned, I quickly pulled my hands and the cigarette away from the tree."

Noreen Renier's ability to enchant such an array of law-enforcement personnel, some to the point of praising the value of her assistance despite contrary evidence (as in the "missing plane" case), is nothing short of astounding. But as even a tasty meal begs dessert, *A Mind for Murder* leaves me hungry for a morsel of compelling scientific evidence to substantiate this sort of "psychic" power as fact rather than fiction.

Sylvia Browne's Latest: Ghost-Written?

JOE NICKELL

Secrets & Mysteries of the World. By Sylvia Browne. Hay House, Carlsbad, California. 2005, ISBN 1-4019-0085-2. 237 pp. Hardcover, $19.95.

Self-proclaimed psychic Sylvia Browne—*who once failed to foresee* her own criminal conviction (in the wake of a gold-mining venture that her strong psychic "feelings" indicated would be successful [SI, Nov./Dec. 2004])—has a new book on the market. As it happens, quite inadvertently on my part, I helped to write it.

Titled *Secrets & Mysteries of the World*, it is an exception to Browne's usual practice of collaborating on a book "with" so-and-so. This time the cover simply reads, "Sylvia Browne." (She added the *e* following her 1992 felony conviction and divorce from Kenzil Dalzelle Brown.)

In producing this book, she says, she *augmented her "intense research" with* her "psychic abilities." (Or alleged abilities, because she continues to refuse to allow her powers to be tested by psychic investigator James Randi, who offers a million dollars to anyone who can genuinely demonstrate extrasensory phenomena.) Browne also claims assistance from "Francine," the imaginary playmate of her childhood who is now the aging Browne's "spirit guide" (11).

Browne says she used psychometry (psychic object-reading) at Stonehenge and got "images of people—hundreds of individuals dragging huge monoliths across a plain" (5–6). However, although she consulted a couple of Web sites *regarding the Bermuda Triangle, she says* it "still remains an enigma to this day" (26, 27). She had better luck with fairies, having seen one—"with wings and all!"—in Ireland (62). However, she can only say she *believes* in the reality of the chupacabra (a blood-sucking entity), being convinced that "it's actually a creature from another planet that was put here for research purposes and sometimes runs amok" (90).

Regarding extraterrestrials, Browne *mentions that her great-uncle, "who was* psychic and worked in the old Spiritualist camps in Florida," was "rabid about UFOs" but had never seen one. However, her Grandmother Ada once encountered an alien being, "a man dressed in all-silver clothing" and with whom she communicated telepathically. The man was tall, but otherwise looked normal. Francine points out that she and other guides have only seen aliens that are humanlike and so go undetected among us (94–96). (So much for the little big-eyed, big-headed "greys" reported by abductees.)

Browne claims that she herself has seen and talked with a tall extraterrestrial *from planet* "PX41," *located* "beyond the Andromeda galaxy" (99). And why not? She also allegedly sees apparitions, talks to ghosts, has visions, divines past lives, makes psychic medical diagnoses, and solves crimes clairvoyantly. She has even formed her own religion, Novus Spiritus ("New Spirit"). Browne makes others with fantasy-prone personalities seem creatively challenged.

Browne quickly dispenses with spontaneous human combustion. It is a reality, she maintains, citing Francine: "She said that SHC is caused by a buildup of phosphorous, which is highly flammable—that's what causes the body to implode upon itself and start burning from the inside out" (164).

However, if readers will stop laughing, it is Browne's ideas on the Shroud of Turin (the reputed burial cloth of Jesus) that interest me most. She shows some admirable skepticism, concluding: "I believe that the Shroud is a representation and not a true relic—but I don't think that should put a dent in our Christian belief" (199). Citing a fourteenth-century bishop's report that the image was painted, Browne writes (196):

> If the Shroud were in fact painted, it would explain some image flaws that have always raised questions. For example, the hair hangs as for a standing rather than a reclining figure; the physique is unnaturally elongated (like figures in Gothic art); and the "blood" flows are unrealistically neat (instead of matting the hair, for instance, they run in rivulets on the outside of the locks). You see, real blood soaks into cloth and spreads in all directions rather than leaving picturelike images.

I found that passage intriguing since I had written (in the July/August 1998 SKEPTICAL INQUIRER, p. 21):

> That the Shroud is indeed the work of a medieval artist would explain numerous image flaws. For example, the physique is unnaturally elongated (like figures in Gothic art!). Also, the hair hangs as for a standing rather than recumbent figure. . . . Everywhere the "blood" flows are unrealistically neat. Instead of matting the hair, for instance, they run in rivulets on the outside of the locks. . . . In addition, real blood soaks into cloth and spreads in all directions, rather than leaving picturelike images.

Now, the shared phrasing between Browne's passage and mine may give new meaning to the term *ghost-written.* Considering the book's lack of any reference to my article, one may wonder: Has Francine stooped to plagiarism? What does Browne know about this? Was she in a trance when she wrote it? Are there other *Secrets & Mysteries of the World* yet to be revealed? □

Joe Nickell is CSICOP's Senior Research Fellow.

Listing does not preclude future review.

Galileo's Children: Tales of Science vs. Superstition. Edited and with introduction by Garnier Dozois. Prometheus Books, 2005. 343 pp. $25, hardcover. Thirteen science fiction tales each depicting the battle of science versus superstition by a noted SF author, many of them Hugo and Nebula winners (Arthur C. Clarke, Ursula K. Le Guin, Robert Silverberg, George R.R. Martin, James Tiptree, and others). The stories all deal in various ways with the struggle to make progress against the wall of superstition and fear in spite of opposition from religious and political forces. Celebrated SF editor Dozois notes that the battles of science versus superstition continue today "as the battle to not have to think only what someone else thinks is okay for you to think." Says he: "Enjoy and ponder."

A Treasury of Deception: Liars, Misleaders, Hoodwinkers and Extraordinary True Stories of History's Greatest Hoaxes, Fakes and Frauds. Michael Farquhar. Penguin Books, New York, 2005. 284 pp. $14.95, softcover. Farquhar tells numerous tales of history's most mischievous human behavior, gathered into ten sections, with headings such as "The deadliest lies ever told," and "All the news that's lipped to print." There are stories of: tricksters, escape artists, forgeries, frauds, and scientific hoaxes, as well as stolen identities and literary liars. This cleverly written guide makes more for entertaining reference (each entry is between one and four pages), than in-depth study. Farquhar's engaging, witty tone "celebrates the infinite forms—whether noble or amusing, absurd or grim—that deception can take."

Perfectly Reasonable Deviations from the Beaten Path: The Letters of Richard P. Feynman. Edited by Michelle Feynman. Basic Books, 2005. 320 pp. $26, hardcover. A delightful compilation of letters by the iconoclastic Nobel laureate physicist over a forty-year span, assembled and introduced by his daughter. Some are moving (letters to his wife who died of tuberculosis in New Mexico during the Manhattan project), some are irritable (Feynmann, who hated self-praise and found it distasteful to judge "merit" and said he also enjoyed being peculiar, adamantly and repeatedly turning down his election to the National Academy of Sciences), and some are downright surprising. Among the latter are his numerous patient letters to young people who wrote for encouragement about going into science.

Truth: A Guide. Simon Blackburn. Oxford University Press, New York, 2005. 238 pp. $28, hardcover. The author of the *Oxford Dictionary of Philosophy* explores the hard fact-based scientific route to truth, as well as the philosophical opponents of this method. He tracks philosophical history from the sophists of ancient Athens to the philosophies of Foucault, Hume, and more. Granting each side a partial ownership of truth, Blackburn implores, "whichever side we embrace, we should know where we stand and what is to be said for our opponents."

Mortal Minds: The Biology of Near Death Experiences. Dr. G.M. Woerlee. Prometheus Books, Amherst, New York. 282 pp. $25, hardcover. Dr. G.M. Woerlee, an anesthesiologist, investigates the history of near death experience lore, and the nature of death itself, as he attempts to unravel the mystery of what really happens when we die. Through his medical research, he stumbles upon the enigmatic theories behind "nocturnal demonic attacks," and grapples with his own philosophical hurdles. The book is largely based in biology, as Woerlee explains the normal sensations our body produces while dying. In the process he provides a better understanding of what happens to our bodies, as well as our minds, as we die.

—Kendrick Frazier and Kathryn Landon

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By arrangement with *Scientific American* (www.sciam.com), July 2005.

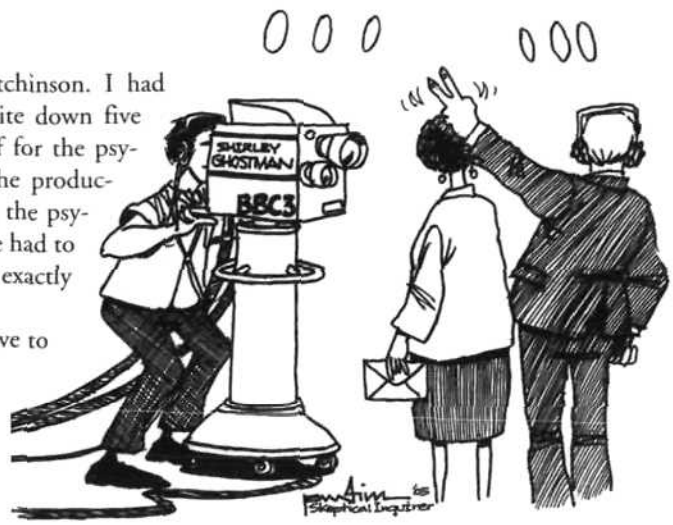
An Unusual Twist in Testing Media Psychics

WENDY M. GROSSMAN

It seemed hardly unusual to be asked to debate a psychic for a TV documentary "exploring spirituality in Britain" on a few days' notice. The fee offered was within the normal range. What might have set off some alarms was the request that I test the psychic. I have no background as a magician, and no track record in testing psychics; anything I know is from reading other people's reports. I suggested several people they might involve, and they noted that one of them, Chris French, a professor of psychology at Goldsmiths College and head of the Anomalistic Psychology Research Unit there, was already slated to appear.

What would have set off alarms, if I had known it, was that the program had in fact booked not two but five skeptics to appear, all on the same day but separately. That was odd: few programs in this country use more than one or two skeptics, and when they do we're not generally kept apart.

But the truth is, I wasn't thinking about any of that. I was worrying that my test might allow the psychic to claim success. I figured I'd better get advice. I called Chris and long-time skeptic and author Mike Hutchinson. I had been asked to write down five facts about myself for the psychic to divine. The production assistant said the psychic had agreed he had to get all five things exactly or he'd fail.



You'd either have to be functioning *on the far* reaches of delusion or operating a very clever, ultra-reliable trick to promise such accuracy. I worried about the trick.

Mike and I talked about reading the end of a pencil and using population stereotypes. Mike told me to watch for carbonless copy paper and clipboards that capture copies of anything written on them. I therefore arrived at the filming location determined to avoid using anything they gave me to write on. I brought several differently colored sheets of paper, some envelopes I'd lined with *tin foil (to ensure no one could make the* envelope transparent by wiping it with alcohol), and several pens. I also had a sealed foil-lined envelope with the five facts written on a sheet inside; this I stuck in my cowboy boot, out of sight or reach. I'd gotten the ideas for the five facts from random dictionary searches to ensure I avoided anything obvious.

Once I got there, a second test was thrown at me: draw a picture for the psychic to guess. I remembered that most people draw one of a handful of drawings. I looked wildly around the *BBC lunchroom and picked the plastic* glass and Coke bottle on the next table. (Oddly enough, one of the five facts I'd written down was: I can't draw.) I did half the drawing (on my own paper) while the person assigned as minder was getting me something to drink, and the other half alone in a bathroom stall. The drawing went in another foil-lined envelope *and in my boot.*

All of these paranoid preparations turned out to be entirely unnecessary. The ivory-suited psychic we met, "Shirley," was too bizarre to take seriously. He made louche suggestions about our "secret shame"—Chris's adultery, my incontinence. He claimed he'd passed the test—"Psychic 7, Skeptic 0!"—by making the wildest interpretations and

Wendy Grossman is founder and former editor of The Skeptic *(U.K.), for which she now writes the "Skeptic at Large" column. She also writes for* Scientific American. *Her Web site is www.pelicancrossing.net.*

loops of illogic imaginable, illogic that absolutely no one would ever believe (trust me on this). Nonetheless, I was very tense until he made his wild stab at the five facts and pulled out a sheet full of little drawings, all of them irrelevant to a Coke bottle.

As soon as I got out I phoned Chris and said, "Did you *believe* that guy?" Everyone else's experience was equally bizarre. Tony Youens, who runs the Association for Skeptical Enquiry, put it most succinctly in an e-mail afterwards: "If that man is a psychic, I'm a lion tamer!"

Two days later, Chris e-mailed to say that on reflection he thought "Shirley" was a spoof. I didn't believe him. How could a group as insignificant as skeptics possibly be the target of a wind-up? A few hours later, through a mix of clever Internet searching, traditional networking, and good journalistic techniques, we had verified that "Shirley" was comedian Marc Wootton, and we had indeed been spoofed. The results are airing as I write this as a series called *Shirley Ghostman* on the digital channel BBC3.

Until now, the business of being a media skeptic has been pretty simple. You argue with a psychic, who may be deluded or a fraud, in front of an audience usually made up primarily of believers. Now, there's another possibility to consider: that the production is lying to you. All TV programs are about entertaining the audience, but the factual ones don't try to make fools of its participants. After eighteen years trying to sell a very unpopular idea, I cared very much if skepticism was made to look a fool. We haven't seen the whole series yet, but so far it seems we've been lucky: the series really may work out a good advertisement for skepticism—as the production team eventually said was intended—rather than its opposite.

Eloquent but Gloomy

RALPH ESTLING

I've always recalled with fondness the scene in Ingmar Bergman's *The Seventh Seal* where the knight and his squire, having just come back, weary and heartsick, from a particularly pointless Crusade, not yet aware that the Black Death is raging through the land, encounter a hooded man sitting by the road, upright and motionless against a rock, his dog waiting patiently at his feet. The knight tells his squire to ask directions to an inn from the man. The squire hauls himself down from his saddle, kneels in front of the sitting man, and finds that he's staring at a rotting corpse. He wordlessly remounts, and he and the knight ride on a little way. "Had he nothing to say?" the knight asks. "On the contrary," his squire replies, "he was most eloquent." He reflects for a moment and then adds, "But gloomy." A director lacking Bergman's magic touch would have stopped with "eloquent."

A close runner-up to this appears in Woody Allen's *Love and Death*, his masterful interpretation of *War and Peace*, where Allen pulls up his droshky (a horse-drawn carriage once used in Russia) in order to give a lift to the local village idiot, who informs him that he's on his way to attend a regional convention of village idiots.

The two scenes stick in my memory because, besides being magnificent, they, each in its way, remind me of the same thing. We don't expect to come across a dead man sitting by the roadside. Yet, if we're living in fourteenth-century Europe in the midst of a bubonic plague, it's not so unexpected. We don't expect village idiots to travel much. Yet, if ever they do, then what would be more natural than for them to travel to a convention of village idiots, to seek out their own kind and the congenial

Our frequent columnist Ralph Estling writes from Ilminster, Somerset, England.

conviviality this brings. Each scene depicts the expectation of the unexpected, the exact point of metamorphosis where the bizarre suddenly transforms into the perfectly natural, the commonplace.

When one thinks about it, virtually everything that has ever happened in the history of the Universe was totally unexpected, until it became, suddenly or very gradually over the eons, inevitable. Physicists call this changeover point a *phase transition.* The possibility of any particular event, any phase transition, actually occurring is governed by two factors: all the previous events leading up to it and its own individual, precise time, place, and nature. Thirteen billion, seven hundred million years ago, the odds against your coming into existence were, well, astronomical, with exponentials piled on exponentials, 10 to an order of magnitude of God only knows what. Yet, here you indisputably are, reading this and wondering what in hell I'm going on about.

What I'm going on about is the miraculous nature of the mundane, the incredible, awesome wonder of the everyday, the triumph of the totally implausible.

This realization has occurred to people before but not often enough to enough of them. It occurred to the Nobel laureate biologist Jacques Monod: "Among all the events possible in the Universe the *a priori* probability of any particular one of them occurring is next to zero. Yet the Universe exists; particular events must occur in it, the probability of which (before the event) was infinitesimal. . . . Destiny is written as and while, not before, it happens." (This is found in his *Chance and Necessity.*)

This puts miracles in a precarious position. If *everything* that takes place is incredibly unlikely, as seen from a vantage point far enough back in time from the occurrence of the event, then *nothing* is miraculous. All is random, nothing is determined in advance, all is fortuitous. Right? Well, yes, and absolutely not. Things are random, but *that* randomness? No. Events—but only those that are possible, however unlikely—are preceded by other possible events, and each event closes the gate of future randomness by one nanometer, events pile on events in orders of magnitude not to be contemplated, let alone mathematically reckoned up, until finally, after 13.7 billion years (13.7 billion years being the current guess at the age of the Universe), with events causing and being caused by other events, here I am writing this and here you are reading it, all this, as well as every other event, being inherent in the Big Bang, a potentiality of occurrences each one of which started out 13.7 billion years back with an unbelievable minimality of possibility—and yet, it has happened! Who would have predicted it 13.7 billion years ago! Surely God moves in mysterious ways His wonders to perform.

Alas. With this sort of reasoning, *everything* is a miracle, impossibility (or the next thing to it) made flesh and blood ordinariness, real as a kick up the jacksy, unmiraculous as a pair of dirty socks in a laundry bin.

Time to take a deep breath and think about all this, and to consider that, given time and circumstance, the next-to-impossible will become possible, the possible will become probable, and the probable will evolve into the inevitable. Stuff happens.

There are two possible conclusions to draw: either that miracles are God's way of telling us He's made a cock-up of Creation and has to continuously tinker with it despite all that Omniscience or, far more complicated, to understand that, once we have a Universe, events are bound to happen within it, each event being, initially, next to impossible and randomly or less randomly becoming inescapable. This is what is otherwise known as reality. Reality seldom lives up to our anticipations.

Consider this: Max Born, Nobel laureate in physics and one of Albert Einstein's closest friends, was the grandfather of the pop star Olivia Newton-John, a juxtaposition more suitable for a Monty Python sketch than mere reality but undeniably the case. Not only does stuff happen, but incredible, unbelievable, unimaginable stuff happens! One can only sit, slack-jawed and struck dumb, when confronted with reality such as this. The mere creation of a Universe palls into insignificance in comparison. Is it any wonder that people look askance at reality and all its works?

If **everything** that takes place is incredibly unlikely, as seen from a vantage point far enough back in time from the occurrence of the event, then **nothing** is miraculous.

People have never really taken to reality; it's too complicated, too impossible. We want explanations, but we want them simple. (I've always liked Einstein's admonition that explanations should be made as simple as possible but no simpler.)

Things are not as simple, or as certain, as we would like them to be, with God in His Heaven and all being right with the world. All, it need hardly be said, is not right with the world and never was. I'm not sure what this proves about God, but it does complicate matters terribly.

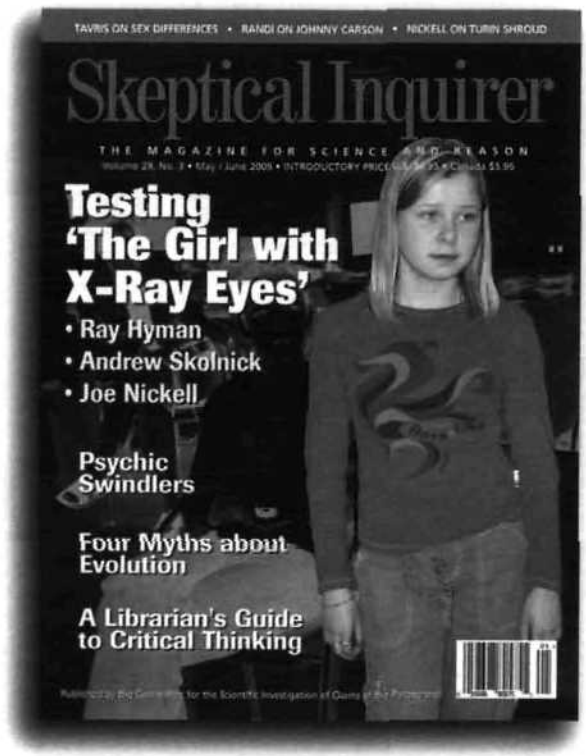
So maybe keeping things simpler than possible is the only way we can manage. Understanding the world will only make the vast majority of us miserable, for we'd come to realize that reality has no time for us and our little lies and subterfuges. Luckily, few of us will ever have to face this problem.

Some more eloquent but gloomy profundities to chew on. □

Statistics of the Natasha Test: Response to Concerns and Questions

RAY HYMAN

The television program *The Girl with the X-ray Eyes* has appeared on the Discovery Channel in Europe and Asia. Although the program has yet to appear in the United States, it generated many reactions. These reactions focused on the test that Andrew Skolnick, Richard Wiseman, and I carried out on the seventeen-year-old girl in question, Natasha Demkina. The two reports of this test, the first by me, the second by Andrew Skolnick, both in the May/June 2005 SKEPTICAL INQUIRER, triggered many additional comments and criticisms [see Letters to Editor, this issue for examples].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Testing 'The Girl with X-Ray Eyes'
• Ray Hyman
• Andrew Skolnick
• Joe Nickell
Psychic Swindlers
Four Myths about Evolution
A Librarian's Guide to Critical Thinking

Many of these reactions are based on misunderstandings. Obviously, the major question is whether Natasha's claim of diagnosis by X-ray vision is true. However, given the constraints of time and resources, we knew our test could not answer this question.

The test was designed and intended to be the first step in a potential sequence of tests. At each step, if she failed to pass the criterion, we would go no further. If she could pass the test at a given stage, this would tell us that it was worth continuing to the next stage. We wrote this into the protocol and made it clear to the Discovery Channel producer. We fully expected that the television program would make the test goals clear to the viewers. Although the television crew did an otherwise excellent job, they completely omitted our important comments about the limited goals for the test. This has aggravated the misconceptions and criticisms of our testing procedures.

The comments and criticisms about our test focused, for the most part, on these issues: 1) the choice of our criterion of five out seven correct matches; 2) the alleged lack of power of our statistical test; and 3) the claim that we should have declared her four correct matches "significant." I do not have space to deal adequately with each of these issues in this brief response. I urge interested readers to consult my longer account (6,200 words) at www.csicop.org/specialarticles/natasha2.html.

Here I will deal with the issues succinctly.

1. *The criterion.* We set the criterion for "passing" the test as five or more correct matches out of seven. Many commentators said that this was too high. These critics rely on abstract ideas about what is a big or a meaningful "effect." Such abstract measures are misleading in our test. In her typical diagnosis, Natasha supposedly has no prior knowledge of the specific ailment that plagues her client. She has to scan the entire body. If her claim is true, this scan requires X-ray vision of extremely high resolution. She has to examine large organs for gross defects. She also has to look for subtle changes in

Ray Hyman is a longtime CSICOP Fellow and an emeritus professor of psychology at the University of Oregon at Eugene.

color and texture plus look at processes at the cellular level.

By contrast, our test presented her with a greatly simplified task. We restricted the targets to unambiguous, easily detected deformities: a large hole in the head covered by a metal plate; metal staples in the chest; a large portion of one lung missing; an artificial hip; and the like. On each trial we told her both *what* to look for and *where* to look. Natasha herself informed the producer before the test that not having to scan the entire body would make her task much less demanding. In the report posted on the Web site listed above, I give additional reasons why this test is much simpler than her typical reading. If Natasha has anything like the ability she claims, she should have easily matched each condition to the appropriate subject. Her claims imply a type of X-ray vision of extremely high resolution. Our test required X-ray vision of very low resolution.

Consequently, if her claim is true, we should expect her to match all seven conditions correctly. We set the criterion at five, rather than at seven, because we wanted to give her some leeway. Getting only four correct matches is highly inconsistent with her claim.

2. *The power of our test.* Some critics claim that our test lacked sufficient power. By this they mean that even if Natasha's claim is true, our test had little chance to show it. In fact, the power of our test was adequate and much higher than the critics maintain. Based on calculations done for me by Professors Persi Diaconis and Susan Holmes of Stanford University's Department of Statistics, the odds of detecting the alternative hypothesis were better than 3:1.

Of course, we would have preferred to have even greater power. We could have increased the odds of detecting the alternative hypothesis by lowering our criterion to four. However, this would have increased the probability of falsely rejecting the null hypothesis. Any statistical test has to cope with two types of possible errors. The Type I error is that of falsely rejecting the null hypothesis (that the results are due to chance). The Type II error is that of failing to accept the alternative hypothesis when, in fact, it is true. For a given set of resources and sample size, anything one does to lower the possibility of one error will increase the probability of the other error. The investigator tries to choose the criterion to achieve an optimal balance between these two types of errors. Many critics seem more concerned about avoiding the Type II error rather than the Type I.

3. *Should four correct matches be "significant?"*: I used Bayesian reasoning to set the criterion at five correct matches. Many critics looked at the probability of Natasha getting four or more correct. Given the null hypothesis, this probability is .0183. Since this is lower than the conventional 0.05 level of significance, they argue that we should have declared the outcome "significant." Whether one looks at this problem from the traditional null hypothesis test (NHT) or from the Bayesian perspective, this claim does not make sense. Most statistical tests compare a null hypothesis with an alternative hypothesis. The typical alternative hypothesis is based on considerations that derive from an accepted theoretical framework. For such noncontroversial hypotheses the .05 level of significance is acceptable. J.B. Rhine recognized that unexpected or unusual hypotheses require a stricter level of significance. He advocated using the .01 level of significance for parapsychological hypotheses. Most orthodox scientists would insist on a level of significance of at least .001 for any paranormal hypothesis.

For the test of Natasha, I chose the .01 level. A criterion of four would be too low to meet that standard. If I had chosen the .001 level of significance, I would have had to set the criterion at seven. Rather than demand perfection, I compromised and the set the criterion at five, which gave us a .01 level of significance and provided adequate power.

If her claim is true, we should expect her to match all seven conditions correctly. We set the criterion at five, rather than at seven, because we wanted to give her some leeway.

4. *A Bayesian perspective.* The statistical calculations give the investigator the probabilities of getting each possible outcome given the truth of a hypothesis. In our test, for example, we could have obtained an outcome from zero through seven (excluding six) correct matches. We can calculate the probabilities of getting each of these outcomes given that either the null hypothesis or the specified alternative hypothesis is true. In our test, Natasha achieved four correct matches. If the null hypothesis were true, the probability of getting four correct matches is 0.0139. If the alternative hypothesis (that the true mean is five) were true, the probability of this outcome would be 0.1562.

The temptation might be to say that this outcome favors the alternative hypothesis. This would be a logical error. The investigator wants to know the probability of each hypothesis given the observed outcome. Unfortunately, what the statistical test yields is the probability of the outcome given the hypothesis. This is the infamous problem of inverse probabilities. We can solve it only if we have knowledge of the prior odds of the

truth of the null hypothesis compared with the alternative hypothesis. In many situations these prior odds are unknown or, at best, highly subjective.

In our case, however, we do have a reasonable basis for assessing these odds. Over the past centuries many individuals have claimed the paranormal ability to diagnose medical problems in a way similar to what Natasha claims. To this day, scientists have not verified even one of these claims. Most scientists would agree that the prior odds against Natasha's claim are more than a thousand to one. Again, I took a conservative position and considered the prior odds against her claim as 99:1.

The Bayesian approach provides a basis for revising the prior odds. An outcome of four correct matches revises the odds from 99:1 to 9:1 *against the alternative hypothesis.* While this outcome does lower the odds against the alternative, it still leaves the odds in favor of the null hypothesis. If Natasha had gotten five correct, the outcome would have lowered the odds to almost 1:1. This still would not swing the odds in favor of the alternative hypothesis. Such a reduction in the odds against her, however, would be enough for me to advocate additional investigation of her claim.

5. *Other considerations*: The statistical test is an idealized situation in which we are comparing two statistical hypotheses to each other. The statistical test helps us decide between the two competing hypotheses. In reality, the investigator is interested in conceptual hypotheses. In our test, the conceptual hypothesis of interest is that Natasha achieves her correct matches by paranormal powers. Many other conceptual hypotheses are also compatible with the alternative hypothesis. The most likely possibility is that Natasha achieves her correct matches by a combination of external clues and luck. If Natasha had "passed" our test, this would have supported the statistical hypothesis that she could average five correct in our situation. However, such an outcome would have been compatible with many possible conceptual hypotheses. We need to conduct further and much more sophisticated tests to decide among the various conceptual possibilities.

Conclusion: I recognize that readers can view our test from a variety of perspectives. These include public relations, propaganda, medical consequences, and science. For me, only the scientific perspective matters. In planning the test, I began with the reasonable assumption that the odds were against the reality of Natasha's claim. The circumstances and constraints imposed upon the test did not allow a direct test of her claim. Instead, we designed the test to see if Natasha could get enough correct matches to justify additional, and more costly, investigations of her claim. The outcome did not reach the criterion that had been set in advance. All parties had agreed with this criterion. Some critics argue that Natasha's four correct matches involve more than just haphazard guessing. Even if this is so, the evidence from our test is consistent with her relying upon external clues. The evidence, as described in my previous reports, is inconsistent with the use of a paranormal diagnostic ability. □

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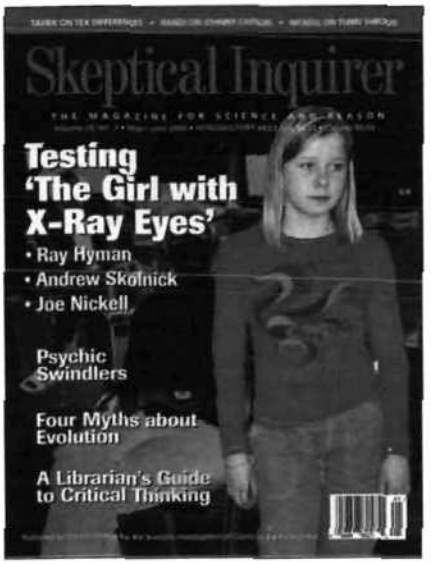

There apparently were a number of hot-button issues in our May/June 2005 issue. Readers had much to say about the article on testing Natasha Demkina, "the Girl with X-ray Eyes"; the four popular myths about evolution; the commentary on gender and science; the critical column on the Gaia hypothesis; and the critical review of Michael Crichton's State of Fear, *among other topics. This section gives a sampling of that reaction. In our Follow-Up in this issue, we publish Ray Hyman's summary of his response to criticisms and concerns about the tests of Natasha. A much more detailed response is posted on our Web site, www.csicop.org.*

—THE EDITOR

Testing the Girl with X-ray Eyes

Natasha Demkina, the girl with the X-ray eyes, is finally being exposed ("Testing Natasha," May/June 2005). There are always those in the population who claim extraordinary powers, but scientists who are in tune with what is real and what is not real come forth and expose them for the charlatans that they are.

I can see how she can grab clues or may know the client's condition beforehand, being prepped to perform in front of her believing spectators. How funny that she can see through clothing but can't see through a common fabric screen.

Natasha, unfortunately, is young, and I hope the criticism doesn't effect her negatively, but enough is enough.

Joseph Anthony Soyo
Walnut Creek, California

Can a test be too fair? That would appear to be the case in the testing of the supposed X-ray eyes of Natasha Demkina.

Fairness in testing is essential, but given that no sane or honest person would contend that anyone has X-ray eyes, why not design a test that would put more of the onus on Demkina, who claims such powers, to prove it?

Granted, the testers did not have a lot of time to design the test and arrange the many details needed to accommodate it, but I think it would have been much more interesting to have conducted a simpler test.

That she and her team got to the test site early and observed the arrival of some of the "scannees" is no surprise. Given the sneakiness of charlatans of her ilk, the "scannees" should have already been in place. Then, she should have been delivered to an unknown (to her and her team) testing location.

As well, Demkina should have been put in front of each of the seven subjects and asked to describe what she saw inside them with her supposed X-ray eyes. Of course, each of the "scannees" would have had something for her to describe that could be detected by X-ray. Also, her translator or her mother or anyone else who had an interest in proving her phony powers should have been separated from her by a screen. After such a test, then her guesses (because that is what they would be) could have been compared to X-rays of the "scannees." Under the conditions of such a test, I don't see how she could have come up with anything close to four out of seven hits.

As it is, I have the uneasy feeling that SKEPTICAL INQUIRER has unwittingly delivered ammunition to the enemy. Supporters of Demkina will look at the results of the testing and say, "Hey! She got four out of seven!" and trumpet the fact that she did better than chance even under the adverse conditions of being tested by an unsympathetic bunch of *skeptics. And you can be darn sure that any*one who would believe that someone has X-ray eyes isn't going to read SKEPTICAL INQUIRER's article on the details of her testing, that explains how it was actually done. Too bad—opportunity missed.

B. Abbott
Port Coquitlam,
British Columbia
Canada

Ray Hyman's article, "Testing Natasha," notes that it was agreed upon prior to testing that five correct matches would be the minimum acceptable score that would convince the authors "of a possible ability to diagnose subjects with sufficient reliability to be useful." Readers might be interested to know that the following probabilities are computed (through use of the matching distribution) *for obtaining 0, 1, 2, 3, 4, 5, and 7 matches:* 0 matches—.368; 1 match—.368; 2 matches—.180; 3 matches—.0624; 4 matches—.0139; 5 matches—.004; 7 matches—.0002. (It is not possible to have six matches without having a seventh.) Although a skeptic myself, and not one who would be inclined to use Natasha's services even if she could produce at least five matches, I believe that, in all fairness, Hyman should have noted that the likelihood of obtaining four correct matches is, in fact, quite low—the value .0139 achieving statistical significance at the 0.5 level (and barely short of the *.01 level).*

Even given the fact that (as Hyman notes) elements of control in the study may have been compromised, possibly providing Natasha with sensory cues, it would seem to me that a reasonable argument could be made for further investigating the girl's abilities.

David Sheskin
Professor of Psychology
Western Connecticut State University
Danbury, Connecticut

Ray Hyman and Andrew Skolnick conclude that Natasha Demkina's performance in their test of her ability to see inside patients' bodies warrants no further investigation, because she correctly matched only four, not five, of seven subjects to their ailments. However, statistically, Natasha performed remarkably well. A random guesser would do as well or better less than 2 percent of the time. (There are 5,040 possible orderings of cards, seventy orderings with exactly four correct, twenty-one with exactly five correct, and one with all seven correct; exactly six correct is impossible.)

Apparently, Natasha was not just guessing, and the effect was relatively large. So, why conclude that no further testing is warranted? Her claim to paranormal powers is, of course, incredible, but the *post hoc* arguments explaining away her score are equally unconvincing.

The key question is, can Natasha diagnose medical conditions better than another

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person who makes no claim of paranormal abilities? Therefore, an improved protocol would include such a control. One might also include fourteen cards describing "obvious" (to one with X-ray vision) conditions, only seven of which would be represented in the subject group. Such a change drastically reduces the number of correct matches by pure chance. For example, in one million computer simulations of such a test that I ran, the random guesser scored two or more right less than 9 percent of the time.

John D. Nagy
Professor of Biology
Scottsdale Community College
Tempe, Arizona

The following table shows the theoretical random probabilities and percentiles for matching seven people with seven medical conditions:

Matches	Probability	Percentile
0	0.3679	0.3679
1	0.3681	0.7359
2	0.1833	0.9192
3	0.0625	0.9817
4	0.0139	0.9956
5	0.0042	0.9998
6	0.0000	0.9998
7	0.0002	1.0000

On average, the number of matches is one. Natasha matched four correctly. This placed her above the 99th percentile. On the basis of this one test, she performed as well or better than would 99.56% of people selected at random. Only forty-four in ten thousand would have done better.

It is extremely unlikely she actually possesses the powers she claims. Our knowledge of the laws of physics and the neurology of the visual system essentially preclude it. More likely, she is a very perceptive individual who capitalized on flaws in the testing procedure. But in any case, physics and neurology were not the basis for the decision. Instead, a single matching test was proposed.

Natasha's responsibility was to show the testers that she could perform well enough to deserve further scientific investigation. The testers proposed a minimum score of five correct. This challenge was accepted by Natasha. She only matched four. The testers concluded that further scientific investigation was unwarranted.

Although the conclusion reached by the testers is undoubtedly correct, their evidence does not provide strong support for it. A few more similar tests with improved experimental controls and a control group would have greatly reduced the possibilities for continued debate.

Dennis Hall
Berkeley, California

Ray Hyman responds to criticisms and concerns about the tests in our Follow-Up section, starting on page 58. A more detailed response is posted on our Web site at: www.csicop.org/specialarticles/natasha2.html.

—THE EDITOR

Myths about Evolution

Charles Sullivan and Cameron McPherson Smith's otherwise admirable article, "Getting the Monkey off Darwin's Back: Four Common Myths about Evolution" (May/June 2005), has a flaw that will, unless corrected, do a serious disservice to the public understanding of evolution. What they call the myth of the "ladder of progress" is objectionable only if taken to mean progress toward some particular goal, such as humanity. It is completely wrong to suggest, as they do, that there is no sense in which evolution is progressive. And it is downright absurd to adduce (as they do) the randomness of mutation in support.

Mutation is indeed random, but natural selection is not. Natural selection drives lineages toward improvement, and this usually means that evolution is progressive. In the case of eyes, for instance, there is an obvious progression from simple beginnings, which could see only the difference between light and dark, to later eyes, such as those of birds and primates, with precise aperture and focus control that present high-resolution, edge-enhanced, color images. Progressive evolution is especially evident wherever there is an evolutionary arms race between, say, predators and prey or parasites and their hosts.

To deny progressive trends in evolution is worse than misleading, it plays into creationists' hands. It panders to the worst myth of all, the one that says that evolution is a theory of random chance. Any fool can see that if evolution really were random, it would be hopelessly inadequate to explain complex biological adaptations such as eyes. I fear that Sullivan and McPherson Smith's article will give aid and comfort to the enemy. I very much hope they will correct their error in their forthcoming book—which I am looking forward to reading.

I have expounded progressive evolution more fully in the last chapter of *The Ancestor's Tale* and in my review of Stephen Jay Gould's *Full House*, reprinted in *A Devil's Chaplain* as "Human Chauvinism and Evolutionary Progress."

Richard Dawkins
New College,
Oxford University
Oxford
England

Given the ongoing controversy generated by American fundamentalists and proponents of so-called Intelligent Design theory, it is of critical importance to educate the public regarding scientists' current views on the theory of evolution. Charles Sullivan and Cameron McPherson Smith should be commended for their article, which clarifies several frequently misunderstood, yet important, points. These misconceptions are well-covered, and hopefully, others will be equally well-clarified in their forthcoming book.

In my reading of their article, one statement struck me as potentially confusing and in need of additional discussion: "Neo-Darwinism offers a natural explanation to account for the facts of evolution, and rejects supernatural explanations." It is my belief that many advocates of creationism and ID are so strenuous in their rejection of evolution because they feel like scientists are attempting to disprove their religious beliefs. I believe that we, as scientists, must emphasize that we have nothing to say on the subject of supernatural intervention in evolution. Perhaps a better way to make this statement would be that science does not even consider untestable supernatural explanations.

Science does not reject religion; it works within a framework where supernatural entities have no place whatsoever. By highlighting the fact that supernatural forces are not even in the realm of science, we will strengthen the case that these creation myths have no place in the science classroom (but rather in religious philosophy classes).

Scientific studies of evolution and people's religious beliefs about the origin of life can undoubtedly coexist, as long as both groups recognize that each domain has no legitimate place in the other. As scientists, we must be careful in our use of language, so that we are not misinterpreted by the sensitive religious who believe our work is a direct attack on their belief systems. For this reason,

I believe an additional myth of evolution that must be dispelled is that Darwinism poses a threat to religious beliefs.

J. Matthew Hoch
Stony Brook, New York

I enjoyed your article titled "Getting the Monkey off Darwin's Back." The flood of criticism still flows 146 years after Darwin published his book, and it shows no sign of abating. The myths referred to are promoted largely by people who, as a matter of religious faith, cannot accept the theory of evolution. Their arguments do not belong in the realm of science at all.

The authors grope for some metaphor that fits the gaps in the fossil record better than missing links of a chain. The chain is the problem, with its series of discrete links suggesting a sharp distinction between species. I prefer to liken evolution to a continuous rope, with fossil discoveries representing points on the rope. Adjacent points on the rope are indistinguishable, but the whole rope would clearly show changes along the way. Each new fossil is another point on the rope, but we cannot expect ever to find all the points.

Don Keith
Waterloo, Ontario

If the authors are working on a book about the top ten myths of evolution, they might consider upping the number with the two myths they themselves have fallen for.

1. *Mutation = variation.* "Variation refers to the random changes—typically mutations—arising in offspring, making them different from their parents" (p. 45). No. Although genetic variation is caused to some extent by mutation, phenotypic variation results from another mechanism. In the course of meiosis, a single set of chromosomes is selected from a diploid set. If chromosome N is present in two forms, A and B, about 8 million different types of gametes can arise from 23 chromosome pairs. A single couple could have 70 trillion different offspring based on chromosome combinations alone.

But it gets even better! Before the chromosomes are separated in meiosis, they are recombined. The chances of a child having any chromosome identical to either of its parents are tiny. Since recombination does not respect gene integrity, some children will have novel genes.

2. Acceptance of evolution is monolithic and complete. Again, no.

Acceptance of evolution is present on a sliding scale from full of misconceptions to (almost) free of them. It is our job as educators to find a path to this goal.

Lee Traynor
Hannover
Germany

If evolution is "only a theory," what is it a theory of? The word is used ambiguously. Biologists have observed evolution in viruses, bacteria, plants, and insects. Breeding of domestic animals depends upon the same types of mechanisms as natural evolution. Evolution is a fact. The theory is that the distributions of species and the dramatic changes found in the fossil record are due to the same "evolutionary" mechanisms that we have observed.

Evolutionary theory does not answer the origin of life question, but there are other scientific theories that do.

Evolution doesn't imply progress? Here the ambiguity is in the word *progress.* There is no guarantee of progress toward the creation of a species in some god's image, but evolution does imply progress toward adaptability toward the environment. Survival imposes a deterministic component on the otherwise random forces of genetic change.

No missing links? Just shades of gray? It is not just a shade of gray that people can't fly (unaided) and birds can. Quantitative differences can lead to qualitative differences. The missing-link problem is that our sampling is sparse and we cannot determine beforehand just what forms should be in the fossil record.

We can make stronger arguments than Sullivan and Smith by not letting the anti-evolutionists define the debate in terms which are incorrect or irrelevant to the essential issues.

Robert Clear
Berkeley, California

Sullivan and McPherson Smith correctly point out that evolution is more than "just a theory." But the layperson needs more than what they've provided to keep his eyes from glazing over at the mere mention that a theory is more than just a rung on the ladder leading to facts.

It needs to be emphasized that building theories is the ultimate goal of science. Thus, calling an idea a scientific theory is granting it the highest level of confidence that science can allow. In this way, it becomes obvious that a theory is an explanation rather than the hunch or guess that *theory* means in the general vernacular.

Simple, understandable examples are usually necessary to illustrate this point. Several good ones are as follows: the heliocentric theory (the *explanation* that the sun is at the center of the solar system), atomic theory (the *explanation* that matter is made of atoms), cell theory (the *explanation* that life forms are made of cells), and the germ theory of disease. These are so basic that even science illiterates should have an inkling as to what they pertain to and in each case the idea of a theory as an explanation is highlighted.

Ray Sutera
Ocean Grove, New Jersey

Sullivan and McPherson Smith presented well-supported and convincing conclusions. I will be using this article to help clarify misconceptions about evolution in my science class. However, there is one argument that is losing support among many evolutionary biologists (as was discussed in my graduate evolution course). In the section subtitled "Evolution Is Only a Theory," the authors stated that the "position of modern evolutionary theory" is that "ancestors of giraffes acquired slightly longer necks through random mutation," because "[t]hese animals could eat food that was a little out of reach of others of their species." This natural selection process was not supported by Steven J. Gould. In 1996, Simmons and Scheepers published their research on this issue in *The American Naturalist* ("Winning by a Neck: Sexual Selection in the Evolution of Giraffe," 148, 772–786).

Simmons and Scheepers demonstrated that sexual selection had a stronger selective pressure for longer-necked giraffes than pure natural selection had, and these pressures seemed to oppose each other. Lions were more successful preying on large male giraffes than smaller ones, which seems to counter a pure natural-selection process. Also, giraffes tend to eat at shoulder height during the dry seasons and not at head level. An observed function of the long necks in males was the act of "necking," which is how two competing males battle each other for a mate. Also, female giraffes were rarely receptive to smaller male giraffes, while they tended to be quite receptive to the largest giraffes.

Gould points out that sexual selection is still part of Darwin's theory of natural selection, so the issue is not a failure of Darwinian evolution but a more accurate view of it.

Michael Hawley
Grand Island, New York

As a good skeptic, I will say that, of course, I could be wrong and will happily stand corrected if appropriate. However, I think that in the process of myth busting, Charles Sullivan and Cameron McPherson have offered one myth to replace another.

Rather than the neck of the giraffe becoming longer as a result of ancestors with long necks being able to feed better and thus producing longer-necked offspring, the actual selective mechanism had to do with mating. Giraffes use their long necks to fight for mates. Those with a longer neck have a mating advantage and thus pass down long-neck genes to their progeny. I seem to recall that my hero, Charles Darwin, made the same error.

David Ziglin
Mukwonago, Wisconsin

Charles Sullivan and Cameron McPherson Smith do a good job of correcting four common myths about Darwin's theory but unfortunately reiterate a couple of common myths about Lamarck's theory.

It is not true (though often mistakenly stated) that Lamarck originated the idea of characteristics, acquired during the lifetime of an individual, being transmitted to the next generation. In his time, this idea was not in dispute. His theory was that in animals with a sufficient nervous system, inner feeling (*sentiment interieur*) of the need to acquire a characteristic which the individual did not possess, but felt a need to acquire, somehow endowed the individual's offspring with that characteristic. And that in animals with rudimentary nervous systems or less, and plants, the same effect was produced by habitual interaction with the environment.

Darwin owned a copy of Lamarck's *Philosophie Zoologique* (1809), on the flyleaf of which he wrote, "Very poor & useless book."

Donald Rooum
London
England

Charles Sullivan and Cameron McPherson Smith respond:

We thank the readers for their careful attention to our article.

Professor Dawkins's point is well taken. The effects of selection are not random, and evolution is poorly described when it is characterized as an entirely random process. Our point was directed at the common conception that evolution has a sort of inner drive, such that species attempt to climb a ladder of progress, inevitably towards humanity. Our mistake was to overemphasize mutation and ignore the ordering effects of selection, which can be considered progress in certain cases. We will take special care to debunk the "evolution is random" fallacy, which we agree is a major point for creationists, in our forthcoming book and other writings.

We respect J. Matthew Hoch's concern for the sensitivities of religious believers. His suggestion that we say that neo-Darwinism *does not consider* supernatural explanations, rather than that it *rejects* supernatural explanations, is not an unreasonable suggestion. However, we're not convinced that scientific and religious views about the origins of life can truly coexist. How life came about is an empirical question, and two very different answers to this question cannot both be right.

Don Keith's suggestion of rope, rather than a chain, as a metaphor for species relationships is insightful. Regarding stone tools and australopithecenes, it is a matter of interpretation whether or not the stone tools found with fossils of *Australopithecus garhi* (first reported in *Science* 284:629–635, 1999) are behaviorally associated with that hominid species, and Dr. Smith's interpretation is that they are. In any case, the point was to highlight the difference between hominid and non-hominid tool use. Many have questioned the restriction of complex tool use to the genus Homo (e.g., see "Is Homo Defined by Culture?" by Bernard Wood and Mark Collard, *Proceedings of the British Academy* 99, 11–23, 1999).

Lee Traynor is correct that much variation is generated via recombination (but only in sexually reproducing species; a distinction that we did not have space to address). Our objective was to highlight the random nature of the origin of variation to combat the strong common conception that evolution somehow "strives," from within, towards perfection. In longer writings, we will certainly address the role of both mutation and recombination in variation.

Robert Clear asks, "What is it [evolution] a theory of?" The late Ernst Mayr put it succinctly in *What Evolution Is*: "Evolution is change in the properties of populations of organisms over time" (New York: Basic Books, 2001, p. 8). To Mr. Clear's point about progress, we direct him to our reply to Professor Dawkins, above, and reiterate that we agree: natural selection acts nonrandomly on random mutations. Regarding his points on missing links and biological shades between classifications, we reply that our objective in this short format was to dispel the myth that discrete links from one form to another, particularly in the fossil record and often demanded by creationists, are not normally available, and that some metaphor other than links in a chain is desirable.

Ray Sutera notes that more is needed in the discussion of the "evolution is only a theory" myth, but magazines have severe space limitations. His examples of other theories are all fine examples, some of which we discussed using in this article.

Michael Hawley's point that sexual selection may be an important aspect of giraffe-neck evolution is interesting. However, the Simmons and Scheepers study is one study, and we would prefer to see more before accepting this alternative hypothesis. Second, and more importantly, our objective was to dispel the myth that evolution "strives," that it is driven from within, and specifically to refute the view of Lamarckian inheritance of acquired characteristics. We feel that the overwhelming majority of laypersons believe that acquired characteristics are transmitted to the next generation, and this was the essential point to dispel.

In the cases we address above, we seem to have oversimplified a few points, largely to meet the short format of a magazine article. We again thank the readers for their comments and assure all that these points will be considered in our future writings, and, where space permits, we will expand on them.

Exposing Psychic Scams

The May/June 2005 SI included an article by Amy Davis titled "Psychic Swindlers" that was fabulous in more ways than one. As an investigative television reporter, Amy very nicely exposed the fraud, con, and scam of an alleged psychic. Any skeptic would applaud that. But there's a deeper beauty to this. At the time Amy published her article in SI, she was working for the NBC affiliate in the moderately populated city of San Antonio, Texas. Davis has since landed a job for the NBC affiliate in Houston—a city with a much larger viewing audience.

This is critical, because in a day and age when sensational broadcasting seems to permeate the media, Amy Davis has shown that a science-friendly, honest, and skeptical reporting style can not only net a nice publication in a skeptical periodical, but that it can also result in a promotion. We need many, many more reporters like Amy Davis. Kudos

also to KPRC-TV in Houston for hiring her.

Keep up the great work, Amy.

Bryan Farha
Professor of Applied
Behavioral Studies in
Education
Oklahoma City University
Oklahoma City, Oklahoma

Science and Gender

The "Invited Commentary" by Carol Tavris on sex differences (May/June 2005) puzzles me.

Tavris's target was Harvard's president, Lawrence Summers, because of his speculating without data that "men have an innate advantage over women in math and science." Just when I thought she had Summers neatly pinned, she let him off.

She tells us: "Males may indeed have an 'innate' advantage at the extreme end of the bell curve, up there in the stratosphere of genius, but for everyone else in the vast middle, the similarities between the sexes in behavior and aptitude are far greater than the differences."

I wish Tavris would cite a reference to that stratospheric atmosphere. Nevertheless, that, I am told, is just where Harvard tries to recruit its faculty, at the high end where Tavris seems to volunteer that there may be a male advantage.

So why does Tavris attack Summers for suggesting the same thing?

Irwin Tessman
Professor Emeritus
Department of Biological
Sciences
Purdue University
West Lafayette, Indiana

SKEPTICAL INQUIRER essays should address the science involved in a topic. Carol Tavris's screed on sex differences emphasizes the unchallenged need to ensure that *all* interested in science and mathematics are encouraged but doesn't address in depth any actual sex differences.

There are differences between groups. At the high end of an achievement scale, these differences show, although they're camouflaged in the vast middle of ability ranges. The overwhelming dominance of Kenyan and Ethiopian men in the Boston Marathon isn't due to a bias against white runners. And the men's marathon winner is always faster than the women's. But as ultra-marathon running matures, it may be that their women have an innate advantage as well.

As an example of difference in the mind, not body; homosexuality seems to be innate, not due to how people are taught to perceive the world, their "socialization," or how attractive a future sexual orientation might seem.

Women were once unfairly excluded from the professions of law, medicine, and engineering. They now comprise significant proportions of law-school and medical-school entrants but still a very small percentage of engineering-school entrants. It's incredible that social-interaction-challenged engineers have managed to continue to exclude women while doctors and lawyers have not.

Tavris is entertaining with *Chocolate Aversion Disorder*, but I would have welcomed a more courageous stance by SKEPTICAL INQUIRER. We got only more warmed-over outrage.

Carl Gurtman
York, Maine

With regard to the commentary by Carol Tavris:

1. Tavris was quick to point out that Lawrence Summers did not present any data to justify his statements. However, I find her own commentary to be devoid of numbers or graphs. Is the pot possibly calling the kettle black when she says, "For the record, let's note that Dr. Summers did not present any data in his remarks"?

2. Later, Tavris emphasizes that "Males indeed have an 'innate' advantage at the extreme end of the bell curve, up there in the stratosphere of genius, but for everyone else in the vast middle, the similarities between the sexes in behavior and aptitude are also far greater than the differences." I have to wonder whether, while composing her argument, Tavris had considered that the similarities in DNA between humans and chimpanzees are also far greater than the differences? Nonetheless, there is a marked difference in what results. I say this not to come across as a bigot or chauvinist but only to identify the apparent flaw in such an argument. . . .

3. Tavris stands on what I consider to be very shaky ground when making the statement "But 'socialization' is wrong too." Her own use of quotation marks around the word *socialization* indicates that its definition is fairly vague. Perhaps I was mistaken, but when I read Summers's comments, I assumed his reference to socialization referred to environmental influences (as opposed to genetic influences) including such things as parenting, education, culture, media, law, business, and government. In which case, the influences that Tavris identifies later in that same paragraph (occupational structure, career demands, availability of day care, percentage of women in the field, influence of friends and peers, the economy, and cultural norms) all fall within the more broadly interpreted definition of socialization. Certainly, all of the above can be sources of bias that lead directly or indirectly to disparities. But then, I didn't find anything in Summers's speech that would indicate otherwise.

4. Finally, Tavris indicates that the state of women's rights is cyclic and dependent on "the current level of hysteria among religious conservatives about sex, marriage, and morals." No argument here. My question though is why more women seem willing to both seek out and accept teleological explanations than men. Is that observed tendency real or just perceived? If real, is it universal or simply a local aberration that I am encountering here in the Bible Belt or here in the twenty-first century? And, if it is both real and universal, what are the potential causes of this tendency (biological or environmental)? It seems to me that this is highly relevant to the question of why there is a disparity between the sexes in the sciences.

Michael Thompson
Canton, Ohio

Carol Tavris's "Invited Commentary" seems somewhat self-contradictory, "politically correct," and sloppy, hardly the work of a genuine skeptical inquirer—to wit:

1. The IEEE, the world's largest electrical-engineering professional organization (of which I am a life member), has been trying for decades to comprehend and "correct" the dearth of women in engineering and the hard sciences.

2. The president of Harvard merely asked an innocuous rhetorical question about whether genes might have something to do with it. He was wrong in asking that question because genes *do* have something to do with it.

3. Her statement that "the individual variances are greater than the variances in the means of the two groups" is the last refuge of a Boazian. She cites the "overlap" as being huge, reminding me that the gene overlap between chimps and humans is over 98

percent. Here, we're talking about tails of the distribution, not means. It is incorrect for Tavris to say this is only the situation with "geniuses." Being at or one sigma above the mean is not unreasonable for qualification to engineering schools (16 percent would qualify). But if one group is one sigma below the other at the start, only 3 percent will qualify. That radical effect explains a lot.

4. She does not tell us why it is reasonable for the humanities faculty of Harvard University to hold a meeting to discuss whether the university president should be fired for his transgressions. She certainly uses the right word, "Kerfuffle." The comment of my wife of sixty years was a little more explicit: "Those people need something to do with their time."

John C. Toomay
jctoomay@cs.com

Gaia Hypothesis

I have just returned from a visit to Norway, and the first journal I looked at was SKEPTICAL INQUIRER, something I look forward to. This time, my enjoyment was ruined by shock and disappointment at the piece "The So-called Gaia Hypothesis" ("Thinking About Science," May/June 2005). Massimo Pigliucci may be right to criticize the way the Gaia hypothesis is taught in a few schools and universities, but the piece was decades out of date as a criticism of Gaia theory, or as it is usually known in the U.S.A., earth system science. It was not so much a critique as a personal and vindictive attack. The hypothesis as it first appeared in the early 1970s was tentative and full of fruitful errors, but it has evolved and now forms the background of research in sciences ranging from climatology to ecology. Gaia theory has made ten successful predictions and was described by the eminent neo-Darwinist William Hamilton in 1999 as "Copernican."

Why on earth did you allow your standards of skepticism to drop so low? To restore my faith in SKEPTICAL INQUIRER and my own self-esteem, will you consider republishing my article ("The Living Earth") that appeared in *Nature* in 2003 (426:769–770)?

James Lovelock
Launceston, Cornwall
United Kingdom

We'll look into running James Lovelock's Nature *article in a future issue.*

—*THE EDITOR*

Always captivated by Massimo Pigliucci's philosophical, political, and scientific knowledge and sensibility, I felt I had to comment on his essay, "The So-called Gaia Hypothesis." Having recently interviewed Dr. Lynn Margulis on my N.Y.C.-based radio program—*Equal Time for Freethought*—I think I can clear up a bit of confusion.

Yes, James Lovelock called Earth a "living organism," but not without criticism from Margulis, who told *Equal Time*'s listeners that Lovelock used that term so that nonscientific people would care enough not to pollute the planet if they thought it was "alive." Margulis herself made it very clear that, for her part, she never agreed that Earth was a "self-organizing organism" but rather a "system" of organisms, as in "ecosystem."

She also told our listeners that there is no way Earth could be an organism, because organisms take in energy or generate energy from sunlight and cannot survive on recycling their own energy or survive on their own waste as the planet would need to do if it were a living organism.

It appears Lovelock got the upper hand as far as what was to be discussed about Gaia when he and Margulis offered their hypothesis. Indeed, Margulis would probably agree with Dr. Pigliucci's observations, and perhaps should be given the opportunity to offer her own essay for SKEPTICAL INQUIRER on the matter.

Barry F. Seidman
Bfs1227@aol.com

Massimo Pigliucci's essay titled "The So-called Gaia Hypothesis" misses a key point. Science does not exist in a vacuum. Public interest in, understanding of, and support for science are vital. "Metaphors have to do some work in order to be beneficial in science," Dr. Pigliucci writes. The work that the Gaia hypothesis has done, and done brilliantly, is to inspire millions of people to appreciate Earth and its ecosystems. That in turn lets people relate to new scientific findings, such as how the eradication of a top predator can unravel an entire ecosystem or why some obscure plant or animal might be deserving of protection. At a time when the environment and science are both under attack, it seems extremely counterproductive to take aim at an idea that has inspired millions of people to think about Earth as something other than an inert object that can be exploited without repercussions.

Robert Adler
Santa Rosa, California

Oh, great. I have, for years, been using the Gaia hypothesis to explain precisely that it is *not* "Intelligent Design" by a god or a goddess but that it is a planetary system that produces and sustains the conditions necessary for living organisms to exist. All along, I have carefully emphasized that it is a metaphor, using the image of the planet as a female that gives birth to and nourishes life, as in the idea of the Greek goddess Gaia. I have also avoided anthropomorphizing the processes and relationships into intention or purpose.

The Gaia hypothesis, however, has pizzazz, and it can be used to educate people who would never dream of sitting through a science lesson in scientific language. Environmentally involved people, for example, need an easy way to see that the planet operates much like a single organism to help them grasp that the interconnected ecological systems need to be valued and protected. Children need images that can capture their attention. The educational software called DaisyWorld, for example, provides them with something they can see in real life.

Apparently, you would deny the validity of this hypothesis as a way to reach children and people who may have never heard of a hard scientific theory, nor want to. And what is the problem Massimo Pigliucci has with the Gaia hypothesis? Apparently, it is that *some* people will misinterpret it as speaking of a literal goddess who intentionally provides the conditions for life, much as others use the image of a creator god. True, some will hear it that way, even when presented as metaphor. But exactly what should be put in its place that people will actually listen to? I have the feeling that the problem Dr. Pigliucci sees is nothing more unscientific than the name of the hypothesis. And the fact that Richard Dawkins doesn't think the hypothesis goes far enough in explaining the evolutionary processes is beside the point. No theory is complete in itself as first presented—including his.

Scotty Zilinsky
Fort Walton Beach, Florida

I was a little surprised that Massimo Pigliucci didn't bring up one potentially harmful implication of extreme forms of the Gaia hypothesis: that ecological policy is unnecessary. After all, if Earth were a "conscious being whose purpose is to keep life safe and sound," then presumably, it would work to clean up our little environmental messes without any prompting from us.

Paul Hilfinger
University of California
Berkeley, California

Massimo Pigliucci responds:

I am not surprised to see so many responses to my column, and I welcome the debate, which I wished to stimulate by writing the column to begin with. I will begin with James Lovelock, who is the chief proponent of the Gaia concept. First, let me assure Dr. Lovelock that there is no "personal and vindictive attack" on my part. I never met or corresponded with Lovelock (so there can be nothing personal about this), and our professional paths have never crossed, since I work in a different field of organismal biology (so there cannot possibly be anything vindictive in my criticism either).

Nonetheless, I still think that the Gaia hypothesis itself, not just the way it has been perceived by part of the public, is at best a bad example of scientific metaphor and at worst a good example of pseudoscience. Lovelock cannot possibly be serious when claiming that Gaia is the foundation of earth system science. The latter is a legitimate multidisciplinary approach to the study of the interconnectedness of physical and biotic systems on our planet, but it is neither informed by nor relies on Gaia. To claim that the latter forms "the background of research in sciences ranging from climatology to ecology" is preposterous and would be news, indeed, to my many ecologist colleagues.

Concerning Barry Seidman's comment about the latest views expressed by Lynn Margulis on his radio program, I'm glad to hear she now thinks that Earth can in no way be considered a living system of its own, though the main reason is—I think—that there is no reproduction and evolution, not just the lack of metabolism in the biochemical sense.

Robert Adler writes of the use of metaphors in science, which, of course, I agree is crucial. (Indeed, I have written on that topic very recently on the pages of SI.) However, there is a difference between an enlightening and a misleading metaphor, and Gaia falls into the latter category because it distorts the science, in particular, what biologists think a living organism actually is. The fact that a misleading metaphor still managed to "inspire millions of people" is no excuse at all; the same could be accomplished with more accurate analogies. After all, we want to teach the public, not preach to them.

Similar comments apply to Scotty Zilinsky's letter, with the addition that I don't think that the Gaia hypothesis is simply an incomplete theory. It is no scientific theory at all, and it doesn't help either science or science education.

Crichton Critique

Chris Mooney criticizes Michael Crichton's "agenda-driven reading of the scientific evidence" in *State of Fear.* But he only offers a different agenda-driven reading. There is something about environmental issues that defies agenda-less critical thinking, stirs up profound emotions, and impairs our ability to read.

Scientists agree that global warming is occurring. The devil is in the details. Scientists disagree on the rate of warming, the proportion attributable to human activities, the expected consequences, and the likely results of proposed remedies. Crichton never denies global warming; he just asks us to distinguish the real state of scientific knowledge from the political hype.

State of Fear is a work of fiction. Environmental activists have never deliberately created disasters to further their cause. Crichton exaggerates to make a valid point: environmentalists have a poor record of scientific objectivity. They have been guilty of cherry-picking their data, of overestimating the certainty of uncertain predictions, of presenting statistics in a way that distorts the truth, and of Chicken Little alarmism. Their enterprise is so vitally important that a bit of fudging can seem acceptable—the end justifies the means. That way, danger lies.

As a skeptic, I welcome any book, fiction or nonfiction, that encourages us to question what the media tells us, to seek out unbiased information, and to think for ourselves. Lighten up, Chris. Kudos, Michael!

Harriet Hall, M.D.
Puyallup, Washington

I was surprised to see how harshly you dealt with Michael Crichton's new book, *State of Fear.* The reviewer acts as though Crichton's medical degree from Harvard does not entitle him to any scientific opinions because he earns his living as a novelist. You have treated the many flim-flam artists you debunk with greater courtesy than you afforded Crichton.

SKEPTICAL INQUIRER has every right to come down hard on the side of anthropomorphic global warming being a crisis in the making for the entire population of planet Earth. However, the tone of Chris Mooney's critique borders on character assassination.

He quotes a number of groups that disagree with Crichton and others who are convinced that man's role in global warming is significant, but Mooney makes no effort to refute the actual data Crichton presents. Your organization has a strong reputation for sound, scientific investigation and thoughtfulness. The reviewer of Crichton's book does not reflect your usual excellent standard.

Jay Lehr
Ostrander, Ohio

Jay Lehr, Ph.D. (lehr@heartland.org) is science director of The Heartland Institute, a free-market think tank.

I was very disappointed in the review of *State of Fear,* by Michael Crichton, which focused on the dangers of politicized science as seen in the issue of global warming. The book seems to have hit a nerve in the reviewer, who responds with derisive remarks about the characters and how they speak, makes claims that journalists and environmentalists couldn't be as bad as Crichton portrays them (stated in light of all the recent journalistic scandals in the major media!), and speaks of bad science by Crichton, concluding that this planet is clearly getting warmer.

Crichton has raised significant questions about the evidence for the case of global warming. The reviewer did not address the points raised by Crichton. He broadly dismissed them. It appears that it is the reviewer who has the agenda.

William R. Mentzer Jr.
Silver Spring, Maryland

I don't read SKEPTICAL INQUIRER for the jejune literary opinions of its reviewers nor for the articles like this which are packed with "sneer/smear quotes" instead of reasoned arguments, nor for diatribes lacking any semblance of rational discourse. In fact, this is the only such article I find in this issue, or that I can remember having read in your magazine during my many years as a faithful reader and subscriber. Indeed, I've read better written, better sourced, and bettered reasoned articles in, e.g., the *Fortean Times* and others of its ilk.

When Mooney sets out to refute Crichton's premise in the book—no, not to refute, but rather to ridicule—he strays too far from the standards of other SI authors, and the editors should have recognized this and pitched this manuscript.

Ralph D. Copeland
San Antonio, Texas

Puzzle Solved by Teen

In the news article "Centuries-old Puzzle Solved by Calgary Teen," by David Park

Musella (May/June 2005), it is stated that a 14-year-old Canadian student solved the puzzle of whether "all polyhedral forms could be reduced to two-dimensional forms with no overlapping by cutting along the edges of their faces." However, much to my disappointment and frustration, it was not revealed whether the student determined whether polyhdral forms can or cannot be reduced in this fashion to two-dimensional forms! What is the point of saying that a question has been answered without giving the answer to the question? Can someone at CSICOP please tell me and others whether it is indeed possible to reduce polyhedrons to two-dimensional forms by cutting along the edges of their faces?

Andrew Jannette
Ottawa, Ontario
Canada

O.K., I give up. Was the fourteen-year-old boy's answer yes or was it no?

Ronald C. Semone
Washington, D.C.

Daniel Bezdek's father replied to our query:

Daniel's work is centered around [t]his new family of convex polyhedra, and in particular, his work shows that the answer to Dürer's question is yes if the goal is to edge-unfold an arbitrary higher-order deltahedron. However, he also noticed the equally important fact that if the convexity condition is dropped in the definition of higher-order deltahedra, then the answer to Dürer's question becomes no.

Fashionable Nonsense Really Is Fashionable

I found it quite amusing to find the last page of Phil Molé's review of *The Dictionary of Fashionable Nonsense* (May/June 2005) making the correct observation that "*natural* often serves as a synonym for good, thereby implying that all natural herbal remedies are better than 'artificial' *scientific" ones, then quoting the Dictionary*'s lampooning of "herbs" as "natural, organic, pure, wholesome" and "much better because not chemical—chemicals, of course, are toxic." Okay. Now look down on the very same page where you put the "Top Ten Best Sellers" in the science category. Look at number seven: *The Naturally Clean Home: 101 Safe and Easy Herbal Formulas for Nontoxic Cleansers.*" That hits the trifecta! Natural. Herbal. Toxic. A science best seller? I guess fashionable nonsense really is fashionable.

Richard Carrier
Point Richmond, California

The photograph of Carl Sagan on the July/August 2005 cover was taken by Tom Flynn. We regret the credit omission.

The letters column is a forum for views on matters raised in previous issues. **Letters should be no more than 225 words.** Due to the volume of letters not all can be published. Address letters to Letters to the Editor, SKEPTICAL INQUIRER. Send by mail to 944 Deer Dr. NE, Albuquerque, NM 87122; by fax to 505-828-2080; or by e-mail (send as e-mail text, not as an attachment) to letters@csicop.org (include name and address).

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For more information, contact Barry Karr, Executive Director of CSICOP, at **716-636-1425**. All inquiries are held in the strictest confidence.

Skeptical Inquirer

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AUSTRALIA. Canberra Skeptics, Canberra Australia. Peter Barrett, President. PO Box 555, Civic Square ACT 2608 Australia. **Australian Skeptics Inc.**, Australia. Barry Williams, Executive Officer. Tel. 61-2-9417-2071; e-mail: skeptics@kasm.com.au. PO Box 268, Roseville NSW 2069 Australia. www.skeptics.com.au. **Australian Skeptics**—Hunter Region Newcastle/Hunter Valley. Dr. Colin Keay, President. Tel.: 61-2-49689666; e-mail: bolide@hunterlink.net au. PO Box 166, Waratah NSW 2298. **Australia Darwin Skeptics**, Northern Territory, Australia. Simon Potter, Secretary. Tel.: 61-8-8932-7552; e-mail: dwnskeptic@ais.net.au. PO Box 809, Sanderson NT 0812 Australia. **Gold Coast Skeptics**, Queensland, Australia. Lilian Derrick, Secretary. Tel.: 61-7-5593-1882; e-mail: lmderrick@telstra.easymail.com.au. PO Box 8348, GCMC Bundall QLD 4217 Australia. **Queensland Skeptics Assoc. Inc.** (Qskeptics) Queensland. Bob Bruce, President. Tel.: 61-7-3255-0499; e-mail: qskeptic@uq.net.au. PO Box 6454, Fairview Gardens QLD 4103 Australia. **South Australia Skeptics (SAS)** South Australia. Mr. Laurie Eddie, Secretary. Tel.: 61-8-8272-5881; e-mail: allang@txc.net.au. PO Box 377, Rundle Mall SA 5000 Australia. **Australian Skeptics in Tasmania Inc.**, Tasmania, Australia. Fred Thornett, Secretary. Tel.: 61-3-6234-1458; e-mail: fredthornett@hotmail.com. PO Box 582, North Hobart, TAS 7000 Australia. **Australian Skeptics**—Victorian Branch Victoria. Christopher Short, President. Tel.: 613-1800-666--996; e-mail: contact@skeptics.com.au. GPO Box 5166AA, Melbourne VIC 3001 Australia. www.skeptics.com.au. **WA Skeptics**, Western Australia. Dr. John Happs, President. Tel.: 61-8-9448-8458; e-mail: wa.skeptics@australiamail.com. PO Box 899, Morley, WA 6062 Australia.

ARGENTINA. Alejandro J. Borgo. Revista *Pensar*. E-mail: info@pensar.org; Enrique Márquez, e-mail: skeptic@ciudad.com.ar; Juan de Gennaro, e-mail: argentinaskeptics@gmail.com.

BELGIUM. Comité Belge Pour L'Investigation Scientifique des Phénomènes Réputés Pananormaux Comité Para, Belgium. J. Dommanget, President of the Committee. E-mail: omer.nys@oma.be. Observatoire Royal Belgique 3, ave. Circulaire B-1180, Brussels, Belgium. www.comitepara.be. **Studiekring voor Kritische Evaluatie van Pseudowetenschap en Paranormale beweringen** (SKEPP) Belgium. Prof. Dr. W. Betz. Tel.: 32-2-477-43-11; e-mail: skepp@skepp.be Laarbeeklaan. 103 B-1090 Brussels, Belgium. www.skepp.be.

BRAZIL. Opçao Racional, Brazil. Luis Fernando Gutman. Tel.: 55-21-548-2476; e-mail: fernandogutman@hotmail.com. Rua Santa Clara, 431 Bloco 5, Apt. 803, Copacabana-Rio de Janeiro 22041-010 Brazil. www.opcaoracional.com.br.

BULGARIA. Bulgarian Skeptics, Bulgaria. Dr. Vladimir Daskalov. E-mail: egoshev@einet.bg. Krakra 22 BG-1504 Sofia, Bulgaria.

CANADA. Alberta Skeptics, Alberta. Greg Hart, Chairman. Tel.: 403-215-1440; e-mail: hartg@humaneffort.com. PO Box 5571, Station 'A', Calgary, Alberta T2H 1X9 Canada. http://absskeptics.homestead.com. **Alberta Skeptics, British Columbia Skeptics**, BC and Alberta. Lee Moller. Tel. 604-929-6299; e-mail: lee moller@shaw.ca. 1188 Beaufort Road, N. Vancouver, BC V7G 1R7 Canada. **Ontario Skeptics**, Ontario, Canada. Eric McMillan, Chair. Tel.: 416-425-2451; e-mail: eric@we-compute.com. P.O. Box 554 Station "P" Toronto, ON M5S 2T1 Canada. www.astro.yorku.ca/~mmdr/oskeptics.html. **Toronto Skeptical Inquirers** (TSI) Toronto. Henry Gordon, President. Tel.: 905-771-1615; e-mail: henry_gordon@hotmail.com. 343 Clark Ave., W., Suite 1009, Thornhill, ON L4J 7K5 Canada. **Ottawa Skeptics**, Ottawa, Ontario. Greg Singer. E-mail: skeptic@ottawa.com. PO Box 1237, Station B, Ottawa, Ontario K1P 5R3 Canada. www.admissions.carleton.ca/~addalby/cats/skeptic.html. **Sceptiques du Quebec**, Quebec. Alan Bonnier. Tel.: 514-990-8099. C.P. 202, Succ. Beaubien Montreal, Quebec H2G 3C9 Canada. www.sceptiques.qc.ca. **Skeptics Quinte**, Bill Broderick. 2262 Shannon Rd. R.R. 1, Shannonville, ON K0K 3A0; e-mail: broderic@kos.net.

CHINA. China Association for Science and Technology, China. Shen Zhenyu Research Center, P.O. Box 8113, Beijing China. **Hong Kong Skeptics**, Hong Kong. Brad Collins, P.O. Box 1010, Shatin Central Post Office, Shatin NT China.

COSTA RICA. Iniciativa para la Promoción del Pensamiento Crítico (IPPEC) San Jose. Adolfo Solano; e-mail: didiersolano@hotmail.com. Postal address: Adolfo Solano (IPPEC-CR), A.P. 478-7050, Cartago, Costa Rica.

CZECH REPUBLIC. Sisyfos-Czech Skeptics Club. Czech Republic. Ms. Ing. Olga Kracikova, Secretary. Tel.: 420-2-24826691; e-mail: olgakracikova@email.cz. Hastalska 27 Praha 1 110 00 Czech Republic. www.fi.muni.cz/sisyfos/ (in Czech).

DENMARK. Skeptica: Association of Independent Danish Skeptics, Denmark. Willy Wegner. Tel.: 45-75-64-84-02; e-mail: skeptica@skeptica.dk. Vibevej 7 A DK 8700 Horsens, Denmark. www.skeptica.dk.

ECUADOR. Prociencia, Peter Schenkel, PO Box 17-11-6064 Quito, Equador. Tel.: 593-2-226-8084; e-mail: schenkel@ecnet.ec.

ESTONIA Horisont. Indrek Rohtmets. EE 0102 Tallinn, Narva mnt. 5.

FINLAND. SKEPSIS, Finland. Jukka Hakkinen. PO Box 483, Helsinki 00101 Finland.

FRANCE. AFIS, AFIS (Association Française pour l'Information Scientifique) France. Jean Bricmont, President. 14 rue de l'Ecole Polytechnique F-75005 Paris, France. **Cercle Zététique**, France. Paul-Eric Blanrue. 12 rue; David Deitz. F-57000 Metz, France. **Laboratoire de Zététique** (laboratory). Professeur Henri Broch. Tel.: 33-0492076312; e-mail:broch@unice.fr. Université de Nice-Sophia Antipolis Faculté des Sciences F-06108 Nice Cedex 2 France. www.unice.fr/zetetique/.

GERMANY. Gesellschaft zur wissenschaftlichen Unterrsuchung von Parawissenschaften (GWUP) Germany. Amardeo Sarma, Chairman. Tel.: 49-6154-695023. E-mail: info@gwup.org. Arheilger Weg 11 D-64380 Rossdorf, Germany. www.gwup.org. **European Council of Skeptical Organizations** (ECSO) Europe. Dr. Martin Mahner. Tel.: 49-6154-695023; e-mail: info@ecso.org. Arheilger Weg 11 64380 Rossdorf, Germany. www.ecso.org/.

HUNGARY. Tényeket Tisztelk Társaságа TTT Hungary. Prof. Gyula Bencze. Tel.: 36-1-392-2728; e-mail: gbencze@rmki.kfki.hu. *c/o Természet Világa*, PO Box 246 H-1444 Budapest 8 Hungary.

INDIA. Atheist Centre, Dr. Vijayam, Executive Director. Benz Circle, Vijayawada 520 010, Andhra Pradesh, India. Tel.: 91 866 472330; Fax: 91 866 473433. E-mail: atheist@vsnl.com. **Maharashtra Andhashraddha Nirmoolan Samiti** (MANS) states of Maharashtra & Goa. Dr. Narendra Dabholkar, Executive President. Tel.: 91-2162-32333; e-mail: ndabholkar@hotmail.com. 155, Sadashiv Peth Satara 415001 India. www.antisuperstition.com. **Indian Rationalist Association**, India. Sanal Edamaruku. E-mail: edamaruku@vsnl.com or IRA@rationalist international.net. 779, Pocket 5, Mayur Vihar 1, New Delhi 110 091 India. Dravidar Kazhagam, southern India. K. Veeramani, Secretary General. Tel.: 9144-5386555; e-mail: periyar@vsnl.com. Periyar Thidal, 50, E.F.K. Sampath Road Vepery, Chennai Tamil Nadu 600 007 India. www.Periyar.org. **Indian CSICOP**, India, B. Premanand, Convenor. Tel.: 091-0422-872423; e-mail: dayamini@md4.vsnl.net.in. 11/7 Chettipalayam Road Podanur Tamilnadu 641 023 India.

ITALY. Comitato Italiano per il Controllo delle Affermazioni sul Paranormale (CICAP) Italy. Massimo Polidoro, Executive Director. Tel.: 39-049-686870; e-mail: polidoro@cicap.org. P.O. Box 1117 35100 Padova, Italy. www.cicap.org.

IRELAND. The Irish Skeptics Society *c/o* Paul O'Donoghue, 11 Woodleigh Elm, Highfield Rd., Rathgar, Dublin 6. Ireland; www.irishskeptics.net E-mail:contact@irishskeptics.net.

JAPAN. Japan Anti-Pseudoscience Activities Network (JAPAN) Japan. Ryutarou Minakami, chairperson. *c/o* Rakkousha, Inc., Tsuruoka Bld. 2F, 2-19-6, Kamezawa, Sumida-ki,Tokyo. skeptic@e-mail.ne.jp. **Japan Skeptics**, Japan. Dr. Jun Jugaku. E-mail: jugakujn@cc.nao.ac.jp. Japan Skeptics, Business Center for Academic Societies, Japan 5-16-9 Honkomagome, Bunkyo-ku Tokyo 113-8622 Japan.

KAZAKHSTAN. Kazakhstan Commission for the Investigation of the Anomalous Phenomena (KCIAP) Kazakhstan. Dr. Sergey Efimov, Scientific Secretary. Astrophysical Institute, Kamenskoye Plato, Alma-Ata, 050020, Kazakhstan. E-mail: efim@aphi.kz.

KOREA. Korea PseudoScience Awareness (KOPSA) Korea. Dr. Gun-Il Kang, Director. Tel.: 82-2-393-2734; e-mail: KOPSA@chollian.net. 187-11 Bukahyun-dong, Sudaemun-ku, Seoul 120-190 Korea www.kopsa.or.kr.

MALTA. Society for Investigating the Credibility of Extraordinary Claims (SICEC) Malta. Vanni Pule, Chairman. Tel.: 356-381994; e-mail: pulevan@vol.net.mt. P.O. Box 31, Hamrun, Malta.

MEXICO. Mexican Association for Skeptical Research (SOMIE) Mexico. Mario Mendez-Acosta, Apartado Postal 19-546 D.F. 03900 Mexico.

NETHERLANDS. Stichting Skepsis, Netherlands. Jan Willem Nienhuys, Secretary. e-mail: jnienhuy@win.tue.nl. Dommelseweg 1A, 5581 VA Waalre, Netherlands.

NEW ZEALAND. New Zealand Skeptics, New Zealand, Vicki Hyde, Chair. Tel.: 64-3-384-5136; e-mail: Vicki@spis.co.nz. PO Box 29-492, Christchurch, New Zealand. www.skeptics.org.nz.

NIGERIA. Nigerian Skeptics Society, Nigeria. Leo Igwe, Convenor. E-mail: dpc@skannet.com.ng. PO Box 25269, Mapo Ibadan Oyo State, Nigeria.

NORWAY. SKEPSIS. Norway St. Olavsgt. 27 N-0166 Oslo, Norway.

PERU. Comite de Investigaciones de lo Paranormal lo Seudocientifico y lo Irracional CIPSI-PERU, Lima, Peru. Manuel Abraham Paz-y-Mino. Tel.: +51-1-99215741; e-mail: cipsiperu@yahoo.com. El Corregidor 318 Rimac, Lima 25 Peru. www.geocities.com/cipsiperu.

POLAND. Polish Skeptics, Poland. Adam Pietrasiewicz. E-mail: redaktor@iname.com. www.biuletynsceptyczny.z.pl.

PORTUGAL. Associaçao Cépticos de Portugal (CEPO) Portugal. Ludwig Krippahl. E-mail: cepo@interacesso.pt. Apartado 334 2676-901 Odivelas, Portugal. http://cepo.interacesso.pt.

RUSSIA. Dr. Valerii A. Kuvakin. Tel.: 95-718-2178; e-mail: V.KUVAKIN@MTU-NET.RU. Vorob'evy Gory, Moscow State University, Phil. Dept. Moscow 119899 Russia. http://log.philos.msu.ru/rhs/index/htm.

SINGAPORE. Singapore Skeptics. Contact: Ronald Ng. E-mail: ronaldng@iname.com.www.skeptic.iwarp.com.

SLOVAK REPUBLIC (SACT). Slovak Republic. Igor Kapisinsky Pavla Horova, 10 Bratislava 841 07 Slovak Republic.

SOUTH AFRICA. Marian Laserson. P.O. Box 46212, Orange Grove 2119 South Africa. **SOCRATES. South Africa. Cape Skeptics**, Cape Town. Dr. Leon Retief. Tel.: 27-21-9131434; e-mail: leonr@iafrica.com. 5N Agapanthus Avenue, Welgedacht Bellville 7530 South Africa.

SPAIN. El Investigador Esceptico, Spain. Felix Ares de Blas Gámez/Ares/Martinez, P.O. Box 904, Donostia-San Sebastian 20080 Spain. **ARP-Sociedad para el Avance del Pensamiento Critico** ARP-SAPC Spain. Félix Ares de Blas. Tel.: 34-933-010220; e-mail: arp@arp-sapc.org. Apartado de Correos, 310 E-08860 Castelldefels, Spain. www.arp-sapc.org.

SWEDEN. Swedish Skeptics, Sweden. Dan Larhammar, professor chairperson. Tel.: 46-18-4714173; e-mail: vetfolk@physto.se. Medical Pharmacology BMC, Box 593, Uppsala 751 24 Sweden. www.physto.se/~vetfolk/index.html.

TAIWAN. Taiwan Skeptics, Taiwan. Michael Turton, Director. AFL Dept., Chaoyang University. 168 G-lFeng E. Rd., Wufeng, Taichung 413.

UNITED KINGDOM. *The Skeptic* Magazine, United Kingdom. Mike Hutchinson. E-mail: subs@skeptic.org.uk. P.O. Box 475 Manchester M60 2TH United Kingdom.

VENEZUELA. Asociación Racional Escéptica de Venezuela (AREV), Sami Rozenbaum, president. Address: Rozenbaum, Apdo. 50314, Caracas 1050-A, Venezuela. Web site: www.geocities.com/escepticos venezuela. E-mail: escepticos@cantv.net.

United States

ALABAMA. Alabama Skeptics, Alabama. Emory Kimbrough. Tel.: 205-759-2624. 3550 Watermelon Road, Apt. 28A, Northport, AL 35476 US. **Skeptics-Freethought Forum of Alabama**. Skeptics Freethought Forum, Richard Rich, 1801 Beech St. SE, Decatur, AL 35601-3511 US. E-mail: rrbama66@hotmail.com.

ARIZONA. Tucson Skeptics Inc. Tucson, AZ. James McGaha. E-mail: JMCGAHA@PimaCC.Pima.EDU. 5100 N. Sabino Foothills Dr., Tucson, AZ 85715 US. **Phoenix Skeptics**, Phoenix, AZ. Michael Stackpole, P.O. Box 60333, Phoenix, AZ 85082 US.

CALIFORNIA. Sacramento Organization for Rational Thinking (SORT) Sacramento, CA. Ray Spangen-burg, co-founder. Tel.: 916-978-0321; e-mail: kitray@quiknet.com. *PO Box 2215, Carmichael, CA 95609-2215 US.* www.quiknet.com/~kitray/index1.html. **Bay Area Skeptics** (BAS) San Francisco—Bay Area. Tully McCarroll, Chair. Tel.: 415 927-1548; e-mail: tullyann@pacbell.net. PO Box 2443 Castro Valley, CA 94546-0443 US. www.BASkeptics.org. **Independent Investigations Group,** Center for Inquiry-West, 4773 Hollywood Blvd, Los Angeles, CA 90027 Tel.: 323-666-9797 ext 156; Web site:www.iigwest.com. **Sacramento Skeptics Society**, Sacramento. Terry Sandbek, President. 4300 Auburn Blvd. Suite 206, Sacramento CA 95841. Tel.: 916 489-1774. E-mail: terry@sandbek.com. **San Diego Association for Rational Inquiry** (SDARI) President: Richard Urich. Tel.: 858-292-5635. Program general information 619-421-5844. Web site:www.sdari.org. Snail mail address: PO Box 623, La Jolla, CA 92038-0623.

COLORADO. Rocky Mountain Skeptics *(RMS; aka* Colorado Skeptics) Béla Scheiber, President. Tel.: 303-444-7537; e-mail: rms@peakpeak.com. PO Box 4482, Boulder, CO 80306 US. Web site: http://bcn.boulder.co.us/community/rms.

CONNECTICUT. New England Skeptical Society (NESS) New England. Steven Novella MD, President. Tel.: 203-281-6277; e-mail: board@theness.com. *64 Cobblestone Dr., Hamden, CT 06518 US.* www.theness.com.

D.C./MARYLAND. National Capital Area Skeptics NCAS, Maryland, D.C., Virginia. D.W. "Chip" Denman. Tel.: 301-587-3827. e-mail: ncas@ncas.org. PO Box 8428, Silver Spring, MD 20907-8428 US. http://www.ncas.org.

FLORIDA. Tampa Bay Skeptics (TBS) Tampa Bay, Florida. Gary Posner, Executive Director. Tel.: 813-849-7571; e-mail: tbs@cfiflorida.org; 5201 W. Kennedy Blvd., Suite 124, Tampa, FL 33609 US. www.tampabayskeptics.org. **The James Randi Educational Foundation.** James Randi, Director. Tel: (954)467-1112; e-mail jref@randi.org. 201 S.E. 12th St. (E. Davie Blvd.), Fort Lauderdale, FL 33316-1815. Web site: www.randi.org.

GEORGIA. Georgia Skeptics (GS) Georgia. Rebecca Long, President. Tel.: 770-493-6857; e-mail: arlong@hcrc.org. *2277 Winding Woods Dr., Tucker, GA 30084 US.*

IOWA. Central Iowa Skeptics (CIS) Central Iowa, Rob Beeston. Tel.: 515-285-0622; e-mail: ciskeptics@hotmail.com. 5602 SW 2nd St. Des Moines, IA 50315 US. www.skepticweb.com.

ILLINOIS. Rational Examination Association of Lincoln Land (REALL) Illinois. Bob Ladendorf, Chairman. Tel.: 217-546-3475; e-mail: chairman@reall.org. *PO Box 20302, Springfield, IL 62708 US. www.reall.org.*

KENTUCKY. Kentucky Assn. of Science Educators and Skeptics (KASES) Kentucky. 880 Albany Road, Lexington, KY 40502. Contact Fred Bach at e-mail: fredwbach@yahoo.com; Web site www.kases.org, or (859) 276-3343.

LOUISIANA. Baton Rouge Proponents of Rational Inquiry and Scientific Methods (BR-PRISM) Louisiana. Marge *Schroth. Tel.: 225-766-4747. 425 Carriage Way, Baton* Rouge, LA 70808 US.

MICHIGAN. Great Lakes Skeptics (GLS) SE Michigan. Lorna J. Simmons, Contact person. Tel.: 734-525-5731; e-mail: Skeptic31@aol.com. 31710 Cowan Road, Apt. 103, Westland, MI 48185-2366 US. **Tri-Cities Skeptics**, Michigan. Gary Barker. Tel.: 517-799-4502; e-mail: barkerg@svol.org. 3596 Butternut St., Saginaw, MI 48604 US.

MINNESOTA. St. Kloud Extraordinary Claim Psychic Teaching Investigating Community (SKEPTIC) St. Cloud, Minnesota. Jerry Mertens. Tel.: 320-255-2138; e-mail: gmertens@stcloudstate.edu. Jerry Mertens, Psychology Department, 720 4th Ave. S, St. Cloud State University, St. Cloud, MN 56301 US.

MISSOURI. Kansas City Committee for Skeptical Inquiry, Missouri. Verle Muhrer, United Labor Bldg., 6301 *Rockhill Road, Suite 412 Kansas City, MO 64131 US.*

NEBRASKA. REASON (Rationalists, Empiracists and Skeptics of Nebraska), Chris Peters, PO Box 24358, Omaha, NE 68134; e-mail: reason01@hotmail.com; Web page: www.reason.ws.

NEVADA. Skeptics of Las Vegas, (SOLV) PO Box 531323, Henderson, NV 89053-1323. E-mail: rbanderson @skepticslv.org. Web site: www.skepticslv.org./.

NEW MEXICO. New Mexicans for Science and Reason (NMSR) New Mexico. David E. Thomas, President. Tel.: 505-869-9250; e-mail: nmsrdave@swcp.com. PO Box 1017, Peralta, NM 87042 US. www.nmsr.org.

NEW YORK. New York Area Skeptics (NYASk) metropolitan NY area. Jeff Corey, President. 18 Woodland Street, Huntington, NY 11743, Tel: (631) 427-7262 e-mail: jcorey@liu.edu, Web site: www.nyask.com. **Inquiring Skeptics of Upper New York** (ISUNY) Upper New York. Michael Sofka, 8 Providence St., Albany, NY 12203 US. **Central New York Skeptics** (CNY Skeptics) Syracuse. Lisa Goodlin, President. Tel: 315 446-3068; e-mail: info@cnyskeptics.org, Web site: cnyskeptics.org 201 Milnor Ave., Syracuse, NY 13224 US. **Committee for the Scientific Investigation of Claims of the Paranormal.** Barry Karr, Executive Director. Tel: (716) 636-1425 X217; e-mail bkarr@centerforinquiry.net. P.O. Box 703 *Amherst NY 14226.* Web site: www.csicop.org.

NORTH CAROLINA. Carolina Skeptics North Carolina. Eric Carlson, President. Tel.: 336-758-4994; e-mail: ecarlson@wfu.edu. Physics Department, Wake Forest University, Winston-Salem, NC 27109 US. www.carolinaskeptics.org.

OHIO. Central Ohioans for Rational Inquiry (CORI) Central Ohio. Charlie Hazlett, President. Tel.: 614-*878-2742; e-mail: charlie@hazlett.net. PO Box* 282069, Columbus OH 43228 US. **South Shore Skeptics** (SSS) Cleveland and counties. Jim Kutz. Tel.: 440 942-5543; e-mail: jimkutz@earthlink.net. PO Box 5083, Cleveland, OH 44101 US. www.southshoreskeptics.org/.

Association for Rational Thought (ART) Cincinnati. Roy Auerbach, president. Tel: 513-731-2774, e-mail: raa@cinci.rr.com. PO Box 12896, Cincinnati, OH 45212 US. www.cincinnati skeptics.org.

OREGON. Oregonians for Rationality (O4R) Oregon. George Slusher, President. Tel.: (541) 689-9598; e-mail: gslusher@comcast.net. 3003 West 11th Ave PMB 176, Eugene, OR 97402 US. Web site: www.o4r.com.

PENNSYLVANIA. Paranormal Investigating Committee of Pittsburgh (PICP) Pittsburgh PA. Richard Busch, Chairman. Tel.: 412-366-1000; e-mail: mindful@telerama.com. *8209 Thompson Run Rd., Pittsburgh,* PA 15237 US. **Philadelphia Association for Critical Thinking** (PhACT), much of Pennsylvania. Eric Krieg, President. Tel.: 215-885-2089; e-mail: eric@phact.org. By mail C/O Ray Haupt 639 W. Ellet St., Philadelphia PA 19119.

TENNESSEE. Rationalists of East Tennessee, East Tennessee. Carl Ledenbecker. Tel.: 865-982-8687; e-*mail: Aletall@aol.com. 2123 Stonybrook Rd.,* Louisville, TN 37777 US.

TEXAS. North Texas Skeptics NTS Dallas/Ft Worth area, John Blanton, Secretary. Tel.: 972-306-3187; e-mail: skeptic@ntskeptics.org. PO Box 111794, Carrollton, TX 75011-1794 US. www.ntskeptics.org.

VIRGINIA. Science & Reason, Hampton Rds., Virginia. Lawrence Weinstein, Old Dominion Univ.-Physics Dept., Norfolk, VA 23529 US.

WASHINGTON. Society for Sensible Explanations, Western Washington. Tad Cook, Secretary. E-mail: K7RA@arrl.net. PO Box 45792, Seattle, WA 98145-0792 US. http://seattleskeptics.org.

PUERTO RICO. Sociedad De Escépticos de Puerto Rico, Luis R. Ramos, President. 2505 Parque Terra Linda, Trujillo Alto, Puerto Rico 00976. Tel: 787-396-2395; e-mail: Lramos@escepticospr.com; Web site www.escepticor.com.

The organizations listed above have aims similar to those of CSICOP but are independent and autonomous. Representatives of these organizations cannot speak on behalf of the CSICOP. Please send updates to Barry Karr, P.O. Box 703 Amherst NY 14226-0703.

SCIENTIFIC AND TECHNICAL CONSULTANTS

Gary Bauslaugh, educational consultant, Center for Curriculum, Transfer and Technology, Victoria, B.C., Canada
Richard E. Berendzen, astronomer, Washington, D.C.
Martin Bridgstock, Senior Lecturer, School of Science, Griffith University, Brisbane, Australia
Richard Busch, magician/mentalist, Pittsburgh, Penn.
Shawn Carlson, Society for Amateur Scientists, East Greenwich, RI
Roger B. Culver, professor of astronomy, Colorado State Univ.
Felix Ares de Blas, professor of computer science, University of Basque, San Sebastian, Spain
Michael R. Dennett, writer, investigator, Federal Way, Washington
***Sid Deutsch**, consultant, Sarasota, Fla.*
J. Dommanget, astronomer, Royale Observatory, Brussels, Belgium
Nahum J. Duker, assistant professor of pathology, Temple University
Barbara Eisenstadt, psychologist, educator, clinician, East Greenbush, N.Y.
William Evans, professor of communication, Center for *Creative Media*
Bryan Farha, professor of behavioral studies in education, Oklahoma City Univ.
John F. Fischer, forensic analyst, Orlando, Fla.
Eileen Gambrill, professor of social welfare, University of California at Berkeley
Luis Alfonso Gámez, science journalist, Bilbao, Spain
Sylvio Garattini, director, Mario Negri Pharmacology Institute, Milan, Italy
Laurie Godfrey, anthropologist, University of Massachusetts
Gerald Goldin, mathematician, Rutgers University, New Jersey
Donald Goldsmith, astronomer; president, Interstellar Media
Alan Hale, astronomer, Southwest Institute for Space Research, Alamogordo, New Mexico
***Clyde F. Herreid**, professor of biology, SUNY, Buffalo*
Terence M. Hines, professor of psychology, Pace University, Pleasantville, N.Y.
Michael Hutchinson, author; SKEPTICAL INQUIRER representative, Europe
Philip A. Ianna, assoc. professor of astronomy, Univ. of Virginia
William Jarvis, professor of health promotion and public health, Loma Linda University, School of Public Health
I. W. Kelly, professor of psychology, University of *Saskatchewan*
Richard H. Lange, M.D., Mohawk Valley Physician Health Plan, Schenectady, N.Y.
Gerald A. Larue, professor of biblical history and archaeology, University of So. California
William M. London, Touro University, International
Rebecca Long, nuclear engineer, president of Georgia Council Against Health Fraud, Atlanta, Ga.
Thomas R. McDonough, lecturer in engineering, Caltech, and SETI Coordinator of the Planetary Society
James E. McGaha, Major, USAF; pilot
Joel A. Moskowitz, director of medical psychiatry, Calabasas Mental Health Services, Los Angeles
Jan Willem Nienhuys, mathematician, Univ. of Eindhoven, the Netherlands
John W. Patterson, professor of materials science and engineering, Iowa State University
Massimo Pigliucci, professor in Ecology & Evolution at SUNY-Stony Brook, NY
James Pomerantz, Provost, and professor of cognitive and linguistic sciences, Brown Univ.
Gary P. Posner, M.D., Tampa, Fla.
Daisie Radner, professor of philosophy, SUNY, Buffalo
Robert H. Romer, professor of physics, Amherst College
Karl Sabbagh, journalist, Richmond, Surrey, England
Robert J. Samp, assistant professor of education and medicine, University of Wisconsin-Madison
Steven D. Schafersman, asst. professor of geology, Miami Univ., Ohio
***Béla Scheiber**, systems analyst, Boulder, Colo.*
Chris Scott, statistician, London, England
Stuart D. Scott, Jr., associate professor of anthropology, SUNY, Buffalo
Erwin M. Segal, professor of psychology, SUNY, Buffalo
Carla Selby, anthropologist/archaeologist
Steven N. Shore, professor and chair, Dept. of Physics and Astronomy, Indiana Univ. South Bend
Wacław Szybalski, professor, McArdle Laboratory, University of Wisconsin-Madison
Sarah G. Thomason, professor of linguistics, University of Pittsburgh
Tim Trachet, journalist and science writer, honorary chairman of SKEPP, Belgium
David Willey, physics instructor, University of Pittsburgh
*Member, CSICOP Executive Council

CENTERS FOR INQUIRY

www.centerforinquiry.net

TRANSNATIONAL
P.O. Box 703, Amherst, NY 14226
Tel.: (716) 636-1425

WEST
4773 Hollywood Blvd., Los Angeles,
CA 90027 Tel.: (323) 666-9797

METRO NEW YORK
One Rockefeller Plaza, #2700,
New York, NY 10020
Tel: (212) 265-2877

POLAND
Lokal Biurowy No. 8, 8 Sapiezynska St., 00-215
Warsaw, Poland

FLORIDA
5201 West Kennedy Blvd., Ste. 124, Tampa, FL
33609, Tel: (813) 849-7571

EGYPT
44 Gol Gamal St., Agouza, Giza, Egypt

FRANCE
Prof. Henri Broch,
Universite of Nice, Faculté des Sciences,
Parc Valrose, 06108, Nice cedex 2. France
www.unice.fr/zetetics/

NEPAL
Humanist Association of Nepal
P.O. Box 5284, Kathmandu, Nepal
Tel: 011977 125 7610

PERU
D. Casanova 430, Lima 14, Peru

EUROPE
Dr. Martin Mahner
Arheilger Weg 11, D-64380 Rossdorf, Germany
Tel.: +49 6154 695023

MOSCOW
Professor Valerii A. Kuvakin
119899 Russia, Moscow, Vorobevy Gory,
Moscow State University, Philosophy Dept.

NIGERIA
P.O. Box 25269, Mapo, Ibadan,
Oyo State, Nigeria
Tel: 231-2-2313699

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Cassiopeia A in Many Colors

This stunning picture of the supernova remnant Cassiopeia A is a composite of images taken by three of NASA's Great Observatories. Infrared data from the Spitzer Space Telescope are colored red; optical data from the Hubble Space Telescope are yellow; and X-ray data from the Chandra X-ray Observatory are green and blue.
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